TECHNOLOGY DEPT.

TELEPHONE ENGINEER

and Management

Crucial Problems Discussed at Spring Conference . . . Page 23

MAY 15, 1942

SCORES OF PLIER SPECIFICATIONS ARE BASED ON
KLEIN TOOLS
EST. 1857
TRADE - MARK
REG
M. KLEIN & SONS
CHICAGO, U.S.A.
M. KLEIN & SONS
CHICAGO, U.S.A.

"Specification 97AR1 Pliers (Klein No. 000 or equal)" is familiar reading during these wartime days of buying by specification. Detailed examination of most plier specifications, however, quickly reveals that they are based on Klein quality. To telephone men who have, for forty years, said "We prefer Klein Pliers", this latest recognition of their good judgment is gratifying. To Leich, as distributor of Klein Pliers, it is doubly gratifying as it emphasizes the importance of quality.

Quality is the first consideration in all Leich-Distributed products.

LEICH SERVICE

LEICH SALES CORPORATION

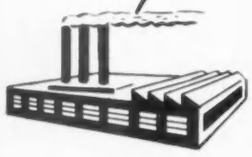
427 WEST RANDOLPH STREET · CHICAGO, ILLINOIS

KELLOGG IN ACTION

Keeping Vital

AT HOME....and in TH

Playing an Indispensable Role Behind the Lines



Helping to Keep Efficiency High in War Production Plants

Bolstering Home Morale with Dependable Telephone Service to Remote Places.

Providing Vital Communications for Civilian Defense Units

That industry can do the giant job outlined in the War Production Program is due, in no small part, to our splendid system of telephone communication.

Kellogg telephone equipment—switchboards, telephones and other apparatus—plays a key role in keeping that system at peak efficiency . . . helping to speed the movement of raw materials to the factories . . . saving precious time in the transmission of messages vital to the war effort . . . helping the farmers get their produce to the markets . . . stepping up inter-office communication in war-industry plants . . . serving in countless other ways to keep our vital telephone lifelines open and our war machine in action.

Of course, with much of Kellogg's output now destined for use by the armed forces, Kellogg equipment for domestic use is being apportioned on the basis of its importance to the Victory Program.

KELLOGG SWITCHBOARD & SUPPLY CO., CHICAGO

KELLOGG MASTERPHONES

Tops for Fine Performance

The rugged construction of Kellogg Masterphones can be depended upon to meet the extra demands of wartime service. They are simple and easy to maintain, and feature the famous patented NON-POSITIONAL transmitter, an outstanding Kellogg contribution to improved telephone transmission.

KELLOGG

★ ★ ★

Lifelines Open

in THE FIELD

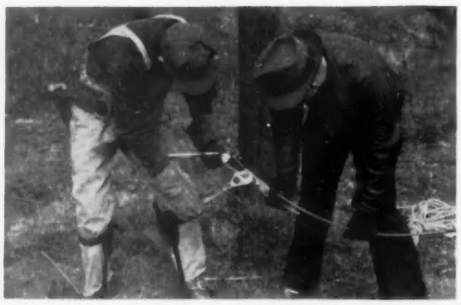
An order to attack . . . to counter-attack . . . to move up reinforcements . . . to establish vital lines of supply . . . these are messages that MUST go through. Dependable communication equipment is an absolute necessity to the army in the field and the pilots in the air. Among the products made for the U. S. Armed Forces by Kellogg are telephone receivers, such as shown here. Other equipment that Kellogg is making for military use includes telephone and telegraph sets, fire reporting switchboards and telephones, microphones of various types, jack and control boxes, etc., etc.

Photo by U. S. Army Signal Corps

EXTRA EDITION

Telephon

KELLOGG LINE SUPPLY



MAKING THIMBLEYE GUY ATTACHMENTS IS GROUND WORK

Chance Thimbleye Guy Fixtures may be attached to the guy strand before being mounted on the pole. Attaching the guy to the pole is then a simple operation. The resulting guy attachment is a dependable, economical job. Several feet of strand is saved, and strength is retained by the curved thimbleye.

ODD.....BUT TRUE !
FLASHLIGHT BATTERIES OPERATE TELEPHONE !
2 BURGESS FLASHLIGHT BATTERIES, PUT IN A TELEPHONE IN AN IMMERGENCY, SUCCESSFULLY OPERATED THE PHONE FOR OVER A YEAR !
THE GLAZE ON PORCELAIN USED FOR KNOBS & TUBES & OTHER TELEPHONE EQUIPMENT IS MADE FROM THE SAME MATERIALS AS THE BODY ! THE ONLY DIFFERENCE IS THAT THE MATERIALS ARE COMPOUNDED IN DIFFERENT PROPORTIONS !
MILO G. KELLOGG AT THE TIME HE FOUNDED THE KELLOGG CO., HAD OVER 150 PATENTS ISSUED TO HIM FOR VARIOUS TELEPHONE AND AND SWITCHBOARD APPARATUS !

Kellogg Koiled Kords Stretch Out To 60 Inches

Kellogg Koiled Kords work as smooth as a coil spring and easily stretch out to 60 inches. Of great importance to you is the fact that these cords save telephone breakage because they are not apt to tangle with other objects or catch under desk or table corners. The action of Kellogg Koiled Kords is entirely secured by molding the outer rubber covering into the permanent coiled shape. This patented construction makes it the longest wearing cord of this type since no mechanical means is used to provide the retractable action.

Sub-Cycle Ringing Machine Saves on Maintenance Cost Because It Has No Moving Parts

No routine maintenance is required on this Sub-Cycle Ringing Machine. It has no moving parts, making it a practically fool-proof source of economical ringing current. It operates on A.C. and produces a powerful, uniform ringing current independent of frequency variations. It is thoroughly field tested and has proved in hundreds of installations that it will give many years of dependable, economical ringing service. Also furnished with Pulsator. 6 models to choose from with 20 to 50 watt outputs.

Phone Men Find That Hemingray Insulators Cut Operating Costs

When a glass insulator can be had that outlasts the pole it's used on, telephone men establish that insulator as their standard. So Hemingray, through carefully controlled production which assures this extra long life, has earned its "first place" position. Made by Owens-Illinois Glass Co., these Hemingray Insulators are impervious to moisture—do not age or deteriorate—have high mechanical and sustained dielectric strength. They are unaffected by sudden temperature changes, and are available in all styles. Specify Hemingray Insulators and cut your operating budget.

...ne Facts

EXTRA EDITION

Are Distributed by the Kellogg Switchboard and Supply Company

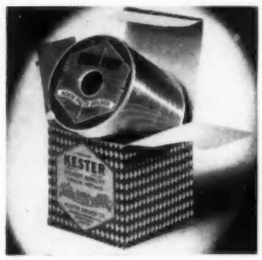
...Y SERVICE OFFERS EXTRAS

Operators' Efficiency Increased by Scientific Posture Support of Modern Cramer Posture Chair

The scientific, adjustable posture support of these modern Cramer Posture Chairs makes operators more comfortable and efficient. 4 adjustments, easily made without tools, make Cramer Chairs adaptable and comfortable for everyone. The seat and back are padded with soft, resilient Whipped Foam Latex "Air Flow" cushions. Movement by the occupant makes air circulate throughout, keeping the seat and back always cool and comfortable. The seat and back covers are easily removed for cleaning or replacement. Write for circular which gives complete details.

HI-CONDUCTO BRONZE DROP WIRE NOTED FOR 85% CONDUCTIVITY

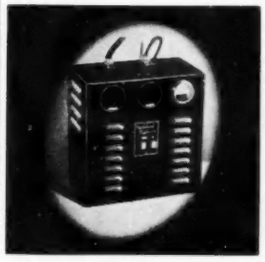
Millions of feet of Kellogg Bronze Drop Wire are now in service throughout the country—practical evidence of the unusual efficiency and long service life for which this drop wire has become famous. Look at these features: A special armored coat of Mica; a better method of tracer identification, banishing forever the old wear-inducing raised tracer; long life, moisture-proof insulation; a solid bronze conductor for 85% conductivity, 32 ohms resistance, high tensile strength and extreme ductility.



For Extra Protection Insist On Kester Rosin-Core Solder

Solder-protected joints eliminate high resistance points and intermittent open and closed circuits. To save trouble, every joint should have this extra protection. For many years, Kester Rosin-Filled Solder has been known as the most satisfactory product of its kind. Nearly 1½ tons of this solder are used every year in the Kellogg factory alone! So to save your time and money, and improve transmission, insist that all joints be properly soldered with Kester Solder. Available on 1-, 5- and 20-pound spools.

Fansteel Balkite Taper Rectifiers Assure Battery Reliability



These dependable rectifiers provide automatic charge regulation for PBX, toll and small central office batteries at the lowest possible cost. Operation is extremely simple. After the charging rate is set to meet the average normal load requirements, the charge rises and falls in proportion to the load demand and variations in battery voltage. The charge automatically follows the load, rising with increased traffic and tapering off during light load periods. No overcharging, no undercharging. Write for Bulletin TC-51.

Extra Services for Phone Men Are Part of Every Line Supply Order

In buying line supplies, whether it's a carload of poles or a handful of wiring nails, there are other important factors to consider besides the merchandise itself.

There's the matters of service, advice, speedy delivery, and the company behind the product—little extras like these which often are as valuable as the material involved.

Kellogg line supplies are made by hand picked, quality manufacturers. These manufacturers co-operate with Kellogg to the fullest extent in making supplies that telephone men can depend on—supplies that do *more* than is expected of them.

Kellogg service is famous in the industry. Over 50 well-stocked line material centers are maintained in order to give telephone men the prompt service they need in these busy times.

The experienced telephone men who handle the line supply orders are well able to offer constructive suggestions—helpful hints that may save time and money and extra work.

Every line supply item carries the famous Kellogg "Double Guarantee." This means that it is guaranteed not only by Kellogg, but by the manufacturer as well.

These *extras*, these things that go with every order, large or small, *are* important. So important, in fact, that more telephone men every year prefer to order their line supplies from Kellogg.

SAVE ALL ALONG THE LINE WITH

COPPER SAVING, DOLLAR SAVING

COPPERWELD

TELEPHONE companies are getting more miles of line with less copper by using Copperweld. And not only are they saving copper but they are getting all the Copperweld advantages of high strength, good conductivity, rust-resisting life and easy handling. Copperweld wire is guaranteed to have the rust-resisting life of solid copper. Copperweld wire stays new — its better voice transmission and greater safety are permanent characteristics.

COPPERWELD → REQUIRES ONLY 30% (OR 40%) COPPER

USE COPPER WISELY · DO NOT WASTE

COPPER WIRE → REQUIRES 100% COPPER

COPPERWELD STEEL COMPANY

GLASSPORT, PA.

Entered as Second Class Matter at the Post Office at Pontiac, Ill., under the Act of March 3, 1879.

—They Need
P. B. X. SERVICE

The saving of time is most important in today's high pressure production schedule. This means that many plants now engaged in defense work must replace their present telephone equipment. Uncle Sam is willing to grant priorities when better equipment means *speed*.

P. B. X. switchboards are needed to take the place of equipment which filled the bill under the slower tempo of peace times.

Stromberg-Carlson, in its No. 120 and No. 121 P. B. X. Switchboards, offers an ideal solution to the problem. These boards not only embody every advanced engineering practice demanded by today's telephony, but are housed in cabinets that will make them attractive items of office furniture for a good many years to come.

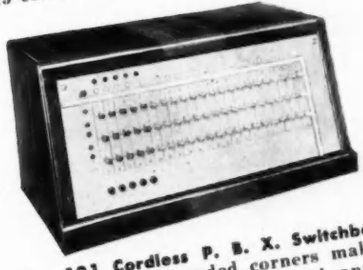
Write for illustrated brochure

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY
Factory and General Offices: 100 Carlson Road, Rochester, N. Y., U. S. A.
Branch Offices: Chicago Kansas City San Francisco Toronto

THESE TWO STROMBERG-CARLSON MODELS FILL THE NEED . . .

The No. 120 P. B. X. Switchboard—The rich appearance of the Sun Tan face and keyboard, contrasted with the dark brown of the plugboard, is highlighted by rich brass fittings.

Overall dimensions: Height, 3′ 9⅝″; Width, 2′ 1⅛″; Depth, 2′ 8″. Wiring and Capacity: 80 lines, 15 cords, and 15 trunks.



The No. 121 Cordless P. B. X. Switchboard—Flush panels and rounded corners make this switchboard an instrument of which any office will be proud.

Overall dimensions: Length, 2′ 2¾″; Height, 1′ 2″; Depth, 1′ 2¾″. Wiring and Capacity: 16 lines, 5 trunks, and 5 connecting circuits.

Stromberg-Carlson

MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR FORTY-EIGHT YEARS

TELEPHONE ENGINEER

MANAGEMENT • ENGINEERING • MAINTENANCE

"THE NATIONAL TELEPHONE MAGAZINE"
FOUNDED 1909

VOLUME 46—NO. 5

MAY
1942

CONTENTS

- Highlights of the Communications News by Roland C. Davies 17
- Convention Dates 18
- Wire Chief's Training Course 20
- Crucial Problems Discussed at Spring Conference 23
- Quantitative Design of Central Office Equipment for Smaller Telephone Offices—by Jay G. Mitchell 25
- The Pioneer's Corner 31
- Line and Desk 32
- Indiana Convention Report 36
- Seen and Heard at the Executives' Conference 40
- Communications and Electronic Developments 44
- 25 Years Ago This Month 46
- TELEPHONE ENGINEER Handbook Tables 48
- Index to Advertisers 54

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Office of publication, Pontiac, Illinois. Executive and Editorial Offices 7720 Sheridan Road, Chicago, Illinois. Phone Rogers Park 3040. Subscriptions: U. S., Cuba, Mexico, $1.50 Per Year; Canada, 2.00; In all Other Countries, $3.50. Single copies, U.S.A., 15 cents. All subscriptions should be sent DIRECT to 7720 Sheridan Rd.

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PROTEK-SORB DESICCANT for drying cable splices...

. . . because Protek-Sorb has more than twice the moisture-capacity of other desiccants. It dries cable splices QUICKER and MORE EFFICIENTLY . . . and they *stay* dry. High insulation resistance is maintained permanently! Your regular jobber can supply you with this easy-to-use desiccant that will free you from the dangers of the "boiling-out" method and the inconveniences of "oven-drying".

THE DAVISON CHEMICAL CORPORATION
Industrial Sales Department
BALTIMORE • MARYLAND

WORLD'S GREATEST all around ELECTRIC TOOL

DRILLS–GRINDS–SANDS
SAWS–POLISHES
SHARPENS–CARVES

ONLY $9.95 POSTPAID
GUARANTEED FOR ONE YEAR

The new **WHIZ ELECTRIC TOOL** is the handiest power tool ever made. A rugged tool for power and precision work. Drills through 1/4 inch iron plate in 42 seconds or engraves intricate designs. Handles any material: Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates labor. Plug into any socket AC or DC, 110 volts. Chuck 1/4 inch capacity. Ball bearing thrust. Powerful, triple-geared motor. STANDARD MODEL, with Normal Speed (uses 200 different accessories, instantly interchangeable). **Price only $9.95.**

The only DRILL-TOOL with a full year's guarantee

FREE Accessory outfit (Value $2) includes set of drills, mounted 1½ inch grinder, sanding discs, cutting wheels, mounted brush, polishing wheel, carving burr, etc., FREE with each tool ordered NOW. We pay postage.

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We KNOW HOW THEY FELT!

Those men who earned the first Navy E, back in 1906, must have been the proudest crew of tars in the fleet. We know, for we feel the same bursting pride today. The blue Navy burgee now flying from our flagstaff sends a special thrill through every man in our plant. We're proud to be Americans.

The Navy E is not lightly given, nor lightly received. It means more than Excellence. It stands for a good job well done, for teamwork better than the best . . . and its award to any civilian plant should double and redouble fighting spirit. From now until final Victory dawns, we pledge every effort to help *Keep America Rolling.*

Exide
TELEPHONE BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Good-natured Reminder

These are busy times. The advertisement on the opposite page appears in women's magazines during April and May. In a pleasant way it points out important time-savers. "Be sure of the right number before calling". . . "Answer promptly."

Advertising like this should help to save minutes and make friends for the telephone industry.

COME, WATSON, *what's our next assignment?*

Harrumph! Eh — egad, sir, there's the little matter of the telephone number . . .

Watson, my boy, let's be after it!

Really, sir, it doesn't require *your* talents for detection. Most telephone numbers are in the book.

Ah, a clue — !

No, a point. You see, every one is extremely busy these days. Being sure of the right number before calling is just one way in which to save time for the really important things. Another efficiency note, Mr. Holmes, if you please, is to answer promptly. With millions more calls being placed every day, these little things add up to *hours* more war work.

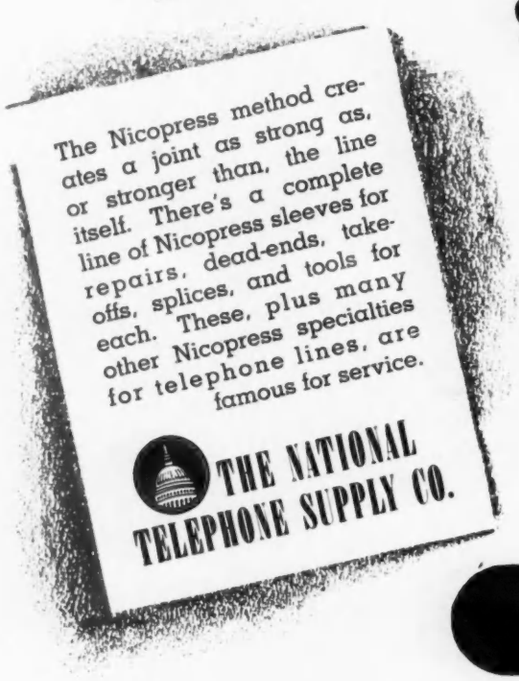
Watson, you're right! Glad you brought it to my attention.

Very kind of you, I'm sure, to co-operate.

BELL TELEPHONE SYSTEM

AN ADVERTISEMENT OF THE BELL TELEPHON SYSTEM

SAVE WIRE
SAVE TIME
SAVE TROUBLE


The Nicopress method creates a joint as strong as, or stronger than, the line itself. There's a complete line of Nicopress sleeves for repairs, dead-ends, take-offs, splices, and tools for each. These, plus many other Nicopress specialties for telephone lines, are famous for service.
THE NATIONAL TELEPHONE SUPPLY CO.

Repair with NICOPRESS SLEEVES and Maintain Top Service!

Save—but don't save at the cost of service. People nowadays are so dependent on telephone service a life may well hang on those slender wires strung over the countryside. And, proper maintenance is so simple with Nicopress repair sleeves there's no need to risk old, noisy joints and possible line failure.

Distributed by

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AUTOMATIC ELECTRIC
SALES COMPANY

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BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO

LENZ
LENZ RECEIVER CORDS
have tough outer braid with the finest moisture proofing assuring long life and trouble-free service.
Keep 'em Talking with Lenz Cords
No. R 304 cord
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LENZ ELECTRIC MANUFACTURING COMPANY
1751 N. WESTERN AVE., CHICAGO, ILLINOIS, U. S. A.
"IN BUSINESS SINCE 1904"

Vacuum Grip Pliers

REG. U.S. PAT. OFF.

Engineers demand "proof"!

TODAY, more than ever, Public Utilities Companies are placing "tool buying responsibility" on the shoulders of their Engineers.

Engineers are interested only in what pliers or any other tools will actually do. Where claims and promises are made they demand "proof"!

The steady sales expansion of Vacuum Grip Pliers in this field is attributed to the fact that they have attracted the favorable attention of an ever widening circle of engineers, by giving proof of superior performance under the severest tests.

Vacuum Grip Pliers measure up to the highest quality and precision standards. In variety of patterns and sizes they offer broad and satisfying coverage.

DIAGONAL CUTTERS

An extensive family of diagonals, furnished in three types for heavy duty and extra heavy duty service in 5-, 6- and 7-inch sizes. The blades of these cutters are specially hardened and tempered, and hand filed for perfect alignment. The smaller sizes are very popular with installation and switchboard electricians. The largest pattern, the famous Vacuum Grip No. 87, is rated as the most powerful pair of diagonals on the market.

LINEMAN PLIERS

Made in two patterns, rounded taper nose and bevel nose. Lengths 6, 7 and 8½ inches. Built with an extra factor of strength. Special "anti-wobble" joint construction. Precision aligned double-bevel cutting blades. Deeply milled grippers in nose. Long-leverage handles with insulation strippers.

NEEDLE NOSE PLIERS

Built for long service. Very sturdy in construction. Joints specially designed for strength. Nose and handles spring tempered. In two types: light weight heavy duty and extra heavy duty. With or without wire cutters. In 5-, 6- and 7-inch lengths.

SMALL ADJUSTABLE GRIPPERS

Great for turning small nuts and for the numerous gripping jobs encountered in switchboard work. Has parallel grip. Teeth set at Stillson Wrench angle. Small in size but a giant in strength. In two types, riveted joint and 3-adjustment slip joint. Length 5 inches.

GRIPPING AND CUTTING PLIERS

These pliers meet the demand for a "two-in-one" pattern that performs gripping and cutting operations equally well. Very strong in construction. The blades have a cutting capacity equal to that of our Lineman Pliers. Teeth true V-form, sharply cut for a non-slip grip. Furnished in three types, in regular and light weight patterns, all for heavy duty service, and all with slide joint for two jaw openings. In 4-, 5-, 6- and 7-inch lengths.

SLEEVE CONNECTOR

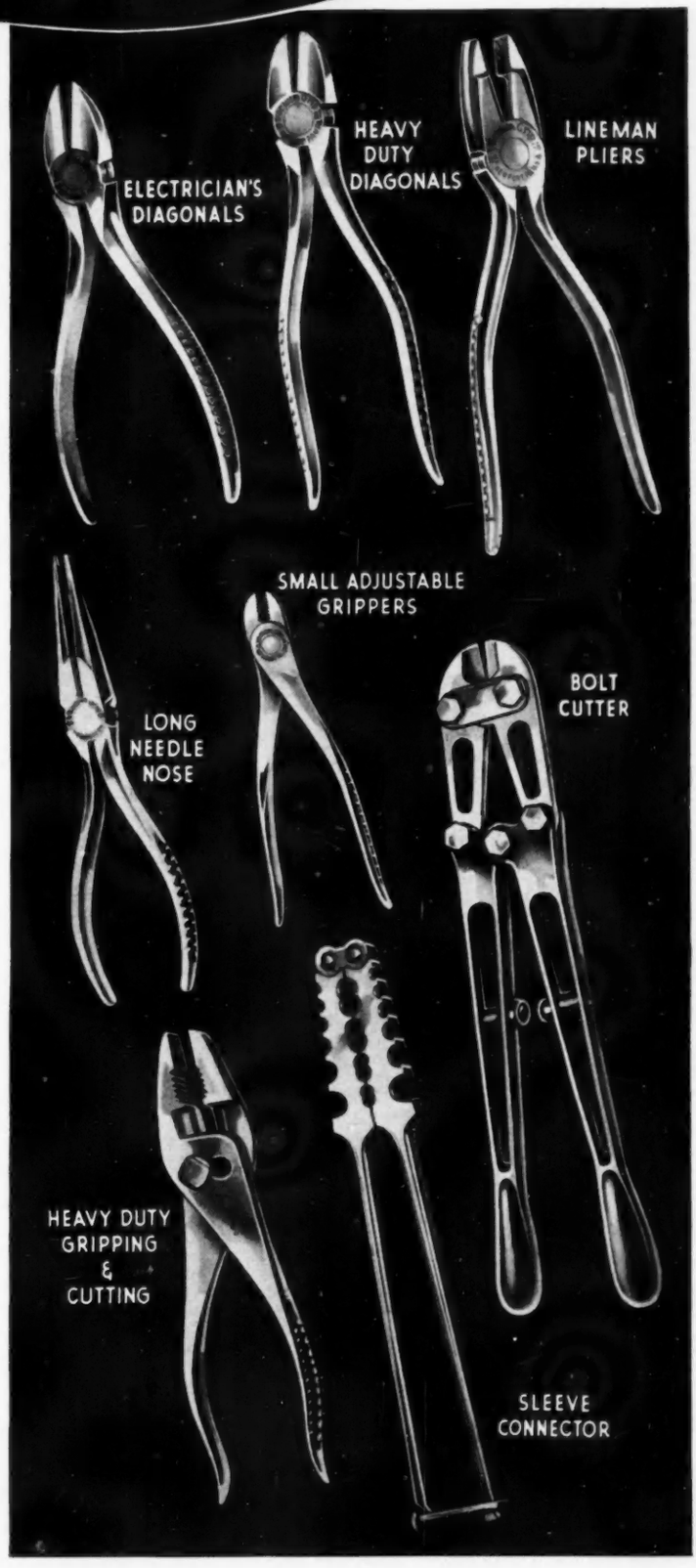
Splices wire of all sizes. Has elliptical hole for guy strands. Retains true alignment during its entire life. Durable in construction. Made of electric furnace tool steel, hardened and oil tempered. Length 12 inches.

BOLT CUTTERS

Linemen pronounce these bolt cutters the most powerful and the most durable made. An over-capacity tool that does the work of cutters measuring from one-quarter to one-third larger. Four types of blades for every cutting job; also two types of nut splitters. Blade assemblies quickly interchangeable as a unit. In four sizes: 14, 18, 24 and 36 inches.

Write for Catalog and ask for details of our 30-Day Trial Plan.

FORGED STEEL PRODUCTS CO., NEWPORT, PA.



TAKE A TIP FROM A MAN WHO KNOWS

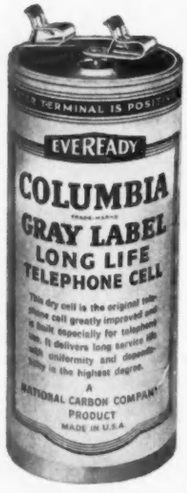
RAY BLAIN, leading telephone engineer and technical writer, says:

"In selecting dry cell batteries for telephone service, be guided by these considerations:

1 They should be designed especially for telephone use.

2 They should have long life.

3 They should be capable of sustaining their operating voltage over a major portion of their life."



MR. BLAIN IS RIGHT! There's a big *difference* in dry cells... yet thousands of service station subscribers are using the *wrong* kind of cells in their telephones: cells built for another job.

Ignition cells are built for *ignition* service—not for telephone service. As such, they can never equal or even *approach* the efficiency and long life of high quality telephone cells.

"Eveready" "Columbia" "Gray Label" Telephone cells are designed for one purpose only—magneto telephone service. They are built to last long months and even years at this particular job, where initial surges are *low*, and the average current consumption *light*.

Recommend "Eveready" "Columbia" "Gray Label" Long Life *telephone* cells to your service station subscribers for improved transmission efficiency... lower battery operating cost.

Here's another fact worth passing on: "Eveready" "Columbia" "Gray Label" Long Life Telephone cells are used by more independent telephone companies than any other brand, because of their higher *sustained voltage . . . uniformity of performance . . . longer life.*

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
UCC
General Offices: New York, N. Y.
Branches: Chicago and San Francisco

The words "Eveready" "Columbia" and "Gray Label" are registered trade-marks of National Carbon Company, Inc.

Highlights of the Communications News

Important Communications developments of the past month, briefed for busy readers

by

ROLAND C. DAVIES
Editor, Telecommunications Reports

AS the torrid summer season in Washington approached, there appeared to be no "siesta" period for the telphone industry in the war-time governmental affairs emanating from the National Capital. There were many governmental fronts for the telephone industry—the huge contemplated additional increases of the Armed Forces prognosticated further demands upon the telephone companies for facilities and service; the tax load was due to be drastically increased in the new War Tax measure now being formulated by Congress; part of the present telephone companies' services, TWX and leased wires, were being considered for transfer to a merged telegraph company; and there was the ever-growing shortage of metals and materials which make up the telephone plant.

Despite the "headaches" and tasks of war-time operation the telephone industry, the civilian regulatory agencies of the Government have been keeping on with a "government as usual" program. The FCC with its "crusading" staff has been continuing investigations into many phases of telephone operations. Notably during May was the culmination of the FCC proceeding into the pension accrual funds of the Bell System with an oral argument at which the spokesmen for the telephone employee organizations vigorously protested the Commission's proposal to have increased pension accruals charged against income or surplus because of its threat to the System's Pension Plan existence. Another inquiry was to broaden the powers of the FCC over hotel, club and apartment house special telephone charges to make the telephone companies responsible for these surcharges by their inclusion in tariffs even though the telephone companies do not establish them and do not receive any revenue from them.

The most interesting recent regulatory development has been the united front by the FCC and Leon Henderson's Price Control Administration to prevent any projected increases in telephone rates to meet rising operating costs and taxes. This was done in the case of the 15 per cent intrastate rate increase of the Northwestern Bell in Iowa. The entrance of the OPA into the telephone rate picture—even though the Price Control Act specifically forbids the OPA's regulation of utility rates—was made on the excuse that there was NO state commission regulation in Iowa. The OPA has also indicated it will survey telephone rates in Delaware and Texas where no state commission regulation also exists.

Chairman Fly

ANOTHER development on the horizon that is of significance to the telephone industry is whether Chairman James Lawrence Fly will be reappointed to the FCC helm for another seven-year term or will be shifted to another important Government post. Chairman Fly's term on the FCC expires July 1 and, because he is also the chieftain of the Defense Communications Board, his designation to continue in his present two posts is a matter of major interest to the entire communications industry. There have been rumors in Washington that the FCC Chairman might encounter stiff opposition for reappointment in

Associated Company Executive Serves Defense Councils

C. F. Mason

REQUISITIONING the executive ability and comprehensive knowledge of California's communications structure possessed by C. F. Mason, president of Associated Telephone Company, Ltd., the Governor of the State and Los Angeles City and County officials have appointed him to serve on State, County and City defense councils.

Responding to Governor Culbert L. Olson's request, Mason has accepted the chairmanship of the subcommittee on communications of the State Defense Council. Members of the committee include representatives of the California Railroad Commission, telephone and telegraph utilities, Office of Civilian Defense and the Attorney General's office. Serving in an advisory capacity to the Governor, the committee is charged with the responsibility of unifying the practices and coordinating the activities, so far as they concern the defense effort, of the many communications agencies operating in the state. The maintenance and reestablishment of communications in emergencies, insurance of adequate and continuous service to the far flung air raid warning system of the state and measures for the detection and prevention of sabotage will be of initial concern to the committee.

In selecting Mason for membership on the Los Angeles County Defense Council, Sheriff Eugene Biscailuz said, "The organization of civilian defense places great responsibility upon the Industrial Resources and Production Committee and it is imperative that men of outstanding ability and experience shall participate in the program." Mason also is a member of the committee on Industrial Utilities of the Los Angeles City Defense Council headed by Mayor Fletcher Bowron.

Congress because of recent attacks made on him, but the validity of these reports has been rather well dispelled by the strong support in the Senate recently in regard to the retention of Dr. Goodwin Watson, FCC Foreign Broadcast Monitoring Service chief analyst, who had been accused of Communist leanings and who had been ordered to be discharged by the House of Representatives. No inkling has yet emanated from the White House as to Chairman Fly's reappointment and there is still the view in some circles that he may be given another important assignment in the Government's war work.

Teletypewriter and Leased Wires

The Bell System's record communications services — the teletypewriter exchange and leased wires—definitely will not be taken over in their entirety as the result of the pending permissive telegraph merger legislation which is now being drafted by the Senate Interstate Commerce Committee. In fact, no change in these two telegraphic services of the telephone industry will be made during the war because of the strong opposition of the Army and Navy to any transfer to a consolidated telegraph company.

In the event of a merger of Western Union and Postal Telegraph, the most that will happen would be to have the consolidated telegraph company handle the merchandising of TWX and leased wires. This latter proposal was voiced by Western Union President A. N. Williams.

These prospects became concretely apparent during the two weeks of hearings in early May by the Senate Interstate Commerce Subcommittee on the McFarland-White permissive telegraph merger bill. The merger legislation, in fact, seems destined to have slow progress, if not rough sledding, in its journey through the Senate. While there was a complete accord that Postal Telegraph was at the end of its financial rope, with merger as the only practical solution to maintain its system, the opposition of both the AFL and CIO unions to a merger because of its effect on employees had confused the minds of the Senatorial sponsors so that the drafting of the legislation will be a most difficult task. It also was definitely established during the two weeks hearings that there will be no attempts to merge the international cable and radiotelegraph companies until after the war.

BOTH the War and Navy Departments were forthright in their position that the telephone industry should continue the operation of the telegraphic services of TWX and leased wires until the war ends because of the vital character and value of these communications services to the Armed Forces. Brigadier General Frank E. Stoner of the Army Signal Corps and Rear Admiral S. C. Hooper respectively presented the positions of the War and Navy Departments on the bill to the Senate Subcommittee.

Western Union President Williams, while stressing that any telegraph merger legislation should include the use by the consolidated telegraph company of the Bell System's record communications services, emphasized that the telegraph merger would only wish to take over "the merchandising of these Bell System services." Under this arrangement, he declared the physical operation of the Bell System TWX and leased wires would be continued as at present through a negotiated agreement with the use of the telephone companies' own circuits, special switchboards and own employees. He stressed that the consolidated telegraph company did not want to take over the telephone employees engaged in these services. Postal Telegraph President E. F. Chinlund took a similar viewpoint. However, the Postal Telegraph executive and FCC Commissioner Clifford J. Durr proposed revisions of the present McFarland-White bill which would make the Bell System services a part of the telegraph merger instead of being subject to voluntary lease or agreement after the merger was consumated.

Spokesmen for the telephone labor unions, however, presented strong contentions that the TWX and leased wires should not be transferred in any way to the telegraph merger on the grounds that these services were very valuable to the public and to the Government especially during the war and that no benefit would result from their being placed with the consolidated telegraph company. Paul E. Griffith, President of the National Federation of Telephone Workers, emphasized that to place the jobs of Bell System employees engaged in TWX and leased wires work in jeopardy through a telegraph merger was unfair and undesirable. He was joined in this position by John J. Moran, President of the Long Lines Federation, and Charles E. Parsons, head of the United Telephone Organizations.

Mr. Griffith described the high state of efficiency of the TWX and leased wire services which were a logical outgrowth of the telephone business and declared that it was not in the public interest to transfer these services to the telegraph consolidation. He contended that such a transfer might cause the deterioration of these services and an increase in their costs.

REPRESENTING the Bell System at the Senate hearings, Harold S. Osborne, American Telephone and Telegraph Co. Plant Engineer, stated that the Bell System was willing to approach any problems involving its telegraph business with an open mind in the event of a merger to work out a satisfactory arrangement. But he was strongly opposed to any idea of compulsory divestment of TWX and leased wires which could be obtained under the proposal of FCC Commissioner Durr to include in the bill a provision to make the telegraph merger mandatory.

The principal point of Mr. Osborne's statement to the Senate Committee was a request that Congress revise the Communications Act by including a concrete definition of the term "line" in connection with Section 214 which covers extensions and new construction. The FCC also is asking for power over abandonments of wire lines and circuits in an amendment of Section 214 contained in the McFarland-White bill. Mr. Osborne described how a clear-cut definition of the term "line" would relieve the telephone companies from the increasingly heavy burden of filing applications with

Convention Dates

Pennsylvania Independent Telephone Association, Sterling Hotel, Wilkes-Barre, May 21, 22 and 23.

New York State Telephone Association, Hotel Syracuse, Syracuse, May 25 and 26.

Wisconsin State Telephone Association, June 3 and 4, Pfister Hotel, Milwaukee, Wis.

North Dakota Telephone Association, Dakota Hotel, Grand Forks, June 9 and 10.

Washington Independent Telephone Association, Portland Hotel, Portland, Oregon, June 12 and 13 (Joint with Oregon Association).

Oregon Independent Telephone Association, Portland Hotel, Portland Oregon, June 12 and 13.

California Independent Telephone Association, Miramar Hotel, Santa Monica, June 18 and 19.

Kentucky Independent Telephone Association, Henry Clay Hotel, Ashland, September 15 and 16.

United States Independent Telephone Association, Hotel Stevens, Chicago, October 13, 14.

Missouri Telephone Assoc., Muehlebach Hotel, Kansas City, Nov. 16, 17 and 18.

the FCC. He described how under the present proposals of the FCC in regard to their powers of Section 214 the telephone companies had to file about 190 applications a year with the threat of a still much larger number if carrier systems are ordered to be placed under that Section. If abandonments are made a part of FCC authority without a definition, the Bell System would have to file a total of about 7,500 applications a year, he related.

Bell System Pensions

THE FCC Proposed Report which would prohibit increased pension accruals from being charged against operating expenses was strenuously assailed by John W. Davis, noted lawyer, on behalf of the Bell System and by five attorneys for telephone labor organizations in an oral argument before the full Commission on the ground that its proposals threatened to terminate the 30-year-old Bell System Pension Plan with serious disruption of the morale of the telephone employees.

The contentions of the labor union attorneys, including the strong presentation by the counsel for the National Federation of Telephone Workers, were believed to have scored a possible victory with the FCC which may lead to the upsetting of the Proposed Report's ban against having the increased accruals come out of operating expenses. The arguments of the telephone labor organizations' spokesmen before the FCC seemed to carry much weight with the Commissioners just as these labor groups had during April apparently convinced the House Ways and Means Committee that a Treasury Department proposal to tax pension trust funds should be rejected because of the danger to the Bell System Pension Plan.

Characterizing the FCC Proposed Report as enunciating broad policies on pension administration rather than being confined to accounting principles, Mr. Davis, who is a director of the American Telephone & Telegraph Co., emphasized that the Report would place the Bell System management in a "straitjacket" in determining the financing policies of the Pension Plan. Picturing how the Bell System Plan had gone through stages of evolution and expansion since its establishment in 1913 from a pay-as-you-go basis to the accrual method, Mr. Davis brought out that the FCC Report would destroy the discretionary powers of the companies in making any imperative and necessary revisions of their accrual programs and that ever since the Plan was inaugurated both the Interstate Commerce Commission and the FCC heretofore had allowed the telephone companies full discretion in the administration of the Plan after they had approved major policy steps. He warned that without permitting the increased accruals to be charged against operating expenses the existence of the Plan was threatened and might terminate its existence if the drain becomes too great upon the System's net income and surplus.

HAROLD V. BOZELL

Mr. Bozell testified before the House Ways & Means Committee recently in opposition to the proposed increase in excise and incorporate telephone taxes.

However, the FCC disclosed that it had won the support of seven state commissions for the conclusions laid down in the Proposed Report. These commissions were the District of Columbia, Washington State, Pennsylvania, California, New York, Wisconsin and Oregon.

The arguments by the five attorneys, representing the telephone employees' organizations of the NFTW and in New England, New York, New Jersey and Pennsylvania, stressed that the Bell System employees regarded their Pension Plan as one of their cherished rights of work in the telephone industry and that they were greatly disturbed over the threat to its perpetuation made in the FCC Report. Charles V. Koons, Washington Counsel of the NFTW, told the FCC that all telephone employees were "pension-conscious" from the time they started on their jobs and that to disturb greatly their morale as has occurred since the issuance of the FCC Report was most injurious at this time because of their strenuous participation in the maintenance of vital communications for the war effort. The economic uncertainties of the present war period were such, they stressed, that the Commission ought to weigh its decision in the light of the present unstable and unpredictable times so as not to create any situation which might threaten the safety of the Pension Plan.

THE oral argument was featured by the caustic and frequent questioning of the labor union attorneys by FCC Chairman James Lawrence Fly who seemed to be doubtful of the fears of the telephone employees concerning the effects of the FCC Report upon the Plan. The Commission chief hurled question after question, particularly during the arguments of Mr. Koons and Henry W. Mayer who appeared for the New York, Pennyslvania, New Jersey and Long Lines employees, asking for "facts not emotional appeals." Both Mr. Koons and Mr. Mayer countered vigorously the Chairman's views by relating that the concern of the employees was deep-seated and that the telephone companies, if forbidden to take care of the increased pension accruals out of operating costs were faced with the realities of having to abandon the Pension Plan. The spokesmen for the labor organizations informed the FCC that the labor groups were not wholly satisfied with certain phases of the Plan but wanted to remedy such situations through collective bargaining. When Chairman Fly and other Commissioners tried to inject the idea of the employees gaining a vested right in the Pension Fund, Mr. Mayer, in particular, brought out that such a goal was a nice idea theoretically but the realities were the costs of such vesting would be so prohibitive as to wreck the Pension Plan.

Stating that the unfunded actuarial liability term was misleading and responsible for many of the erroneous conclusions because the increased accruals were to provide for the unfunded actuarial reserve requirements, Mr. Davis stressed in the concluding portions of his argument that the adoption of the proposed report by the Commission would constitute an arbitrary and unlawful interference with management of the Bell System companies in connection with their administration of the Pension Plan. He challenged the conclusion in the Proposed Report that the unfunded actuarial reserve requirements constituted a past loss and could not be charged against operating expenses, and stressed that Account 672 of the Uniform System of Accounts has been framed to provide for advance accruals of pension funds against future costs of pension retirements.

Tracing with a general description the concept of the Bell System Pension Plan, Mr. Davis told the FCC that this pension program was one of the earliest in the United States and when inaugurated no one knew a great deal about its future aspects. He stated that it was not conceived as a charity enterprise nor as compensation for employees, but was inaugurated under a proper corporate purpose to protect the business against

(Please turn to page 50)

Wire Chief's TRAINING COURSE

SECTION XIV

Subject: *Cable Loading*

(Prepared Expressly for TELEPHONE ENGINEER by the Lincoln Engineering School)

General

ALTHOUGH cable has the distinct advantage over open wire of offering constant resistance over a long period of time and is far less subject to inductive interference, it has the rather serious objection of presenting substantial loss to voice currents as even the best cable circuit has a higher loss than #109 iron wire.

For ordinary exchange purposes, cable can be used successfully in spite of the fact that it has a higher loss than open wire. But where cable is used to replace long open wire leads, that is leads much in excess of two miles in length, some special consideration must be given to the higher transmission loss of cable as compared to open wire. Two methods are available for reducing the loss of cable circuits namely (1) use of vacuum tube repeaters, and (2) cable loading.

Repeaters are practical only on toll cable circuits, however, inductance loading offers a good method of reducing the loss of long exchange cable circuits so that transmission results will be obtained comparable with that with iron open wire.

Basic Theory of Loading

CABLE LOADING consists in connecting small inductance coils in series with the cable pair at periodic intervals along the line. The practical effect of these load coils is to compensate for the high mutual capacity of the cable pair by reducing the energy lost as the voice wave travels along the cable circuit. Load coils also improve the "frequency response" characteristics of a telephone cable making the voice sound more natural thus providing transmission improvement in this manner as well as by reduction of the voice of energy.

The two wires of a cable pair being located close together and separated by a thin dielectric have a much higher capacity than do the two wires of an open pair. The effect of this capacitance is to cause the current and voltage in the speech wave to be thrown out of phase, thus reducing the amount of energy reaching the receiving end of the telephone line. This high mutual capacity of a cable pair results in the higher frequencies being attenuated more than the lower frequencies, with consequent speech distortion.

This effect of cable capacity on frequency response is illustrated quite well by Figures 1, 2 and 3, which are reproduced through the courtesy of the **Automatic Electric Company.** These illustrations show how a 400 cycle tone with a super-imposed frequency of 2400 cycles is affected in passing through an artificial line equivalent to 30 miles of 19 gauge cable both loaded and unloaded. The Figures are actual wave patterns photographed from the screen of a cathode ray oscilloscope.

Figure 1, shows the screen pattern made by the 400 cycle tone with its 2400 cycle super imposed wave, before passing through the artificial cable. Figure 2, shows the same wave after having passed through 30 miles of unloaded artificial cable. In this Figure it will be noted that input wave has not only been greatly attenuated but that the major portion of the 2400 cycle component has been almost entirely lost due to the filtering action of the non-loaded cable. Figure 3, illustrates the effect of loading on the same artificial cable circuit. It will be observed that in Figure 3 both the 400 and 2400 cycle component come through with a minimum of distortion

Fig. 1—400 and 2400 cycle input wave.

Fig. 2—Same wave after passing thru non-locked cable.

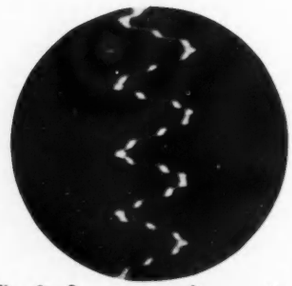


Fig. 3—Same wave after passing thru loaded cable.

and with a greatly reduced overall loss. Fig. 3-A shows attenuation curves for loaded and non-loaded cable.

Loading Equations

LOADED cable has much the same characteristics as an electrical wave filter of the "low pass type," that is the loaded cable will pass with a minimum loss all frequencies up to some critical value but will offer a relatively high loss to frequencies above this value. In general the heavier the loading, the lower will be the critical or "cut off frequency". The term **cut off frequency refers** to the frequency at which the attenuation begins to increase rapidly. The **cut off frequency** in cycles per second can be determined by the equation:

$$\text{cut off freq.} = \frac{1}{\pi\sqrt{LSC}}$$

where L = inductance of loading coil in henries..
S = load coil spacing in miles.
C = mutual capacitance in farads per mile.

The characteristic impedance of a loaded cable circuit is somewhat higher than that of a non-loaded circuit. In some cases it is necessary to take into account the higher impedance of a loaded cable circuit compared to that of the non-loaded cable circuits to which the loaded circuit may be connected. This is done by inserting inequality ratio repeating coils in the cord circuits of the switchboards which are used between such circuits.

Characteristic Impedance of Loaded Cable

THE characteristic impedance of a loaded cable circuit can be found fairly accurately by the simplified equation shown below:
Characteristic impedance, in ohms per mile $= \sqrt{\frac{L}{C}}$

where: L = loading inductance in henries per mile.
C = mutual capacitance between conductors in farads per mile.
Comparative characteristic impedance for loaded and non-loaded cable circuits are shown below:

Type	Loaded	Non-Loaded
24 ga.	1230 W	1007W
22 ga.	1051 W	567W
19 ga.	1017 W	402W

Field of Application

THE chief application that the Independent Telephone Companies have found for loading is on long cable circuits which extend out into a rural district for a number of miles, thus eliminating heavy open wire leads. In most instances exchange cables longer than two miles will require loading if excessive transmission loss is to be avoided.

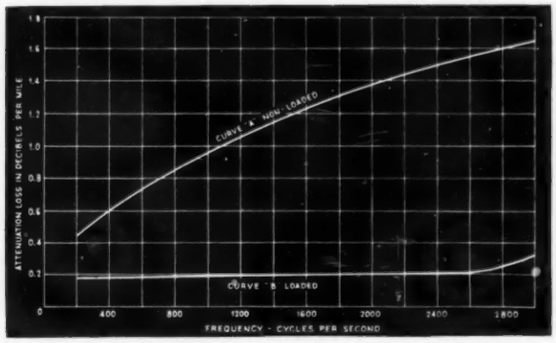


Figure 3-A—These curves show the comparative attenuation (transmission losses) at all voice frequencies, before and after loading a typical cable circuit with Monotype High-Efficiency Loading Coils. The upper curve ("A") shows the attenuation loss per mile, before loading, and shows how rapidly the loss rises at the higher frequencies. The lower curve ("B") shows the greatly reduced loss on the same circuit, after loading. Note that the attenuation after loading is practically uniform over the entire range of frequencies required for lifelike reception.

It is often practicable to carry a small but concentrated load of telephones from a small town or community center to a nearby central office by means of a loaded 25 or 50 pair cable thus effecting a substantial saving in operating expense where a manual board can be displaced by this arrangement.

In the larger Independent exchanges toll entrance cables may require loading in order that the overall loss of the involved toll circuits will not exceed the standards established. In the large multi-office exchanges the trunk cables between the several offices will in many cases require loading for satisfactory transmission.

Load Coil Spacing

IF loading is to be effective it must be properly engineered for each specific situation. It is extremely important that coils of the correct inductance be properly spaced in the cable circuit if the theoretical gains are to be obtained. Load coil spacing ranges from 3000 to 9000 feet between coils. Most loading coil systems require that the coils be placed at either 3000, 6000, or 9000 foot spacing. 6000 foot spacing is most frequently used.

In setting up a loading system the first load coil from the office should be located at the ½ section point, for example at 3000 feet in a 6000 foot system. The balance of the coils are spaced at 6000 foot intervals. It is preferable though not essential that the spacing from the last load coil to the end of the cable also be 3000 feet.

Types of Load Coils

LOAD coils readily available to the Independent field are of three standard "weights", viz., namely: 135, 120, and 88 milli-henries. In general the heavier the weight of loading the lower will be the cut off frequency and the attenuation. For most exchange purposes the 88 milli-henry loading is most popular.

Phantom circuits in quadded cable may be loaded the same as side circuits. Phantom load coils have four windings so poled that they offer inductance only to the phantom currents and not to the side circuits. Fifty milli-henry inductance coils are standard for phantom circuits. In loading quadded cable it is always desirable that a capacity unbalance test be made on the cable between loading sections and that the cable be balanced as accurately as possible in each separate loading section.

Table No. 1 (see next page), gives transmission data on monotype high efficiency loading coils at 6000 foot spacing.

Construction Features of Load Coils

INASMUCH as a number of load coils are required at each loading point, the coils must be compactly housed and connected to a stub cable, thus permitting them to be cut in series with the cable by means of a simple cable splicing operation. The loading coils themselves have cores of finely divided magnetic material which is combined with an insulating compound and moulded into a compact circular ring.

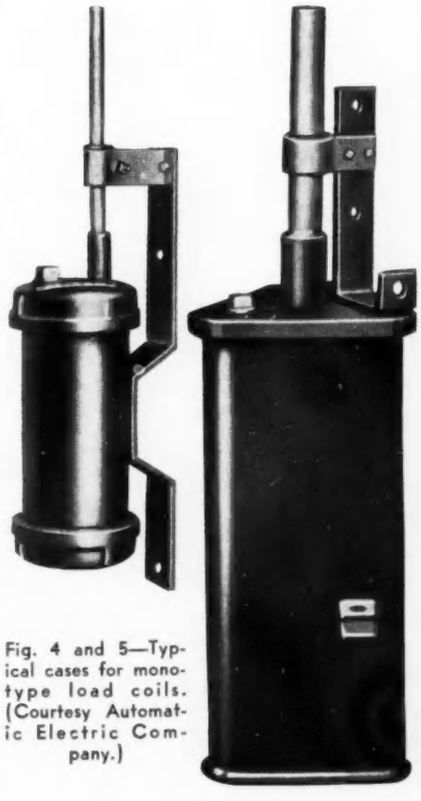


Fig. 4 and 5—Typical cases for monotype load coils. (Courtesy Automatic Electric Company.)

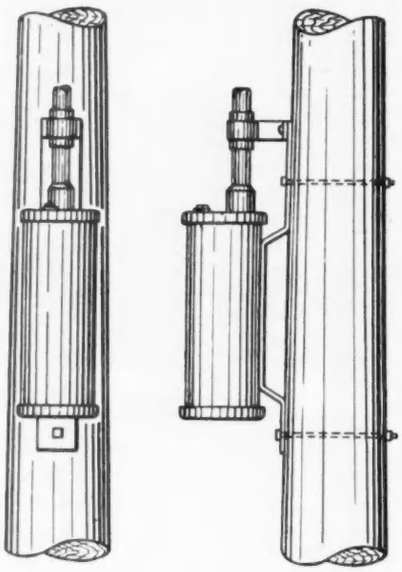


Fig. 6—Typical pole mounted load coil case. (Courtesy Automatic Electric Co.)

It is necessary that the magnetic particles be exceptionally fine and well separated so as to reduce hysteresis loss as well as to resist permanent magnetization by the flow of direct current over the telephone line.

Cases for loading coils usually take the form as shown in Figures 4 and 5. The particular type to be employed depends on the number of coils to be housed. Loading coils are also potted in lead containers which are in reality large lead cable sleeves. This type of container can be supported directly on the messenger in much the same manner as an ordinary sleeve. Where only a few pairs are to be loaded it is feasible to place the loading coils inside of a regular splice, using of course a slightly larger sleeve than would otherwise be required.

The usual method of mounting load coils on wood poles is shown in Figure 6.

Placing Orders for Load Coils

The manufacturers for loading coils are glad to advise as to the use of their coils for any specific situation. In order to be able to engineer a loaded cable system, they need information on the following points:

(1) Length and gauge of cable to be loaded.
(2) Mutual capacitance of cable per mile.
(3) Type of circuits that will work through cable.
(4) Maximum direct current flow through coils.
(5) Is the loading for side circuits only.
(6) Number of circuits of each type to be loaded.

TABLE 1

Calculated Transmission Data on Typical Cable Circuits at 1,000 Cycles

Showing Effect of Loading with Standard A. E. Co. Monotype High-Efficiency Loading Coils (6000 foot Spacing)

CABLE *Mut. Cap., in m. f. per mile*	LOADING COIL *Inductance in henries*	*Attenuation Constant*	RESULTANT CHARACTERISTICS OF CABLE CIRCUITS *Characteristic Impedance in ohms*	*Approx. Cut-Off Frequency*	*Equivalents of One Mile of Cable Decibels*
No. 24 B & S Ga. conds. (Loop Resis., 276 ohms per mile at 68° F.)					
0.085	No Loading	0.2630	720		2.282
	0.135	0.11930	1180	2750	1.036
	0.120	0.12650	1110	2970	1.098
	0.088	0.15030	950	3460	1.305
No. 22 B & S Ga. conds. (Loop Resis., 175 ohms per mile at 68° F.)					
0.073	No Loading	0.20023	620		1.738
	0.135	0.07247	1250	3000	0.629
	0.120	0.07627	1200	3150	0.662
	0.088	0.08790	1000	3750	0.763
0.083	No Loading	0.21359	580		1.854
	0.135	0.07742	1200	2800	0.672
	0.120	0.08134	1100	3000	0.706
	0.088	0.09378	960	3500	0.814
0.090	No Loading	0.2224	550		1.930
	0.135	0.07870	1150	2710	0.683
	0.120	0.0835	1080	2870	0.725
	0.088	0.0970	925	3350	0.842
0.093	No Loading	0.2270	540		1.970
	0.135	0.0790	1130	2675	0.686
	0.120	0.0853	1065	2800	0.740
	0.088	0.0983	910	3280	0.853
No. 19 G & S Ga. conds. (Loop Resis., 86 ohms per mile at 68° F.)					
0.062	No Loading	0.12938	470		1.123
	0.135	0.03433	1390	3250	0.298
	0.120	0.03594	1300	3400	0.312
	0.088	0.04113	1100	4050	0.357
0.080	No Loading	0.14700	420		1.276
	0.135	0.03906	1225	2850	0.339
	0.120	0.04028	1150	3050	0.349
	0.088	0.04666	980	3550	0.405
0.090	No Loading	0.1559	390		1.353
	0.135	0.04002	1150	2710	0.347
	0.120	0.04273	1080	2870	0.371
	0.088	0.04926	925	3350	0.427

Course Examination — Section XIV

1. **Why is loading required with long cable circuits?**
2. **What transmission factors do load coils improve?**
3. **Explain the term "Critical Frequency."**
4. **Is the impedance of a loaded cable higher or lower than that of a non-loaded cable?**
5. **What is the chief application of cable loading in the Independent Field?**
6. **What is the impedance of a 22 gauge loaded cable?**
7. **How far out from the office should the first load coil be located where load coils are spaced 6000 feet apart?**
8. **What is the most popular weight loading coil at the present time?**
9. **What equation is used to compute the characteristic impedance of loaded cable?**
10. **What is the transmission equivalent of 19 gauge-88 millihenry, 6000 foot spaced loaded cable?**

Snapped by "ye editor" at the Executives Conference of the USITA, Chicago April 28, 29—Upper left: State Association Secretaries huddle between sessions, left to right, Chas. C. Deering, Iowa, J. C. Crowley, Jr., Minnesota, A. R. MacKinnon, New York, E. L. Malone, Kentucky and George Kloidy, Nebraska. Upper center: "Big Wigs" and "Brass Hats" of the Independent telephone industry have something to talk about after the first session of the Executives Conference. Lower top center: K. B. Schotte and Grant Harris talk of copper wire and telephone poles. Upper left: I. J. Devoe, Lincoln Ranford Dunlap, Ft. Wayne and Carl Brorein, Tampa, snapped in the Tower Room.

Lower Row—left: Daniel McNulty, F. R. McBerty, Frank McKinney and J. K. Johnston, get their badges at the registration desk. Center: Bruce H. McCurdy and H. Graham Morrison of the telephone section of WPB pose with R. H. Lumpkin, USITA director and special advisor to the section. Lower right: C. E. Archer, Tampa, J. G. Wray, Chicago, John H. Agee, Lincoln Louis Pitcher, Chicago, and J. I. Kennedy, Freeport, stop to look at the birdie.

Crucial Problems Discussed At Spring Conference

THE annual Spring Executives' Conference of the United States Independent Telephone Association met on April 28 and 29 in the Stevens Hotel, Chicago, with more than 200 Independent telephone men present.

The three new WPB telephone orders, issued April 23, were the main items of interest, and discussion of these orders occupied more time than anything else. Because these orders were issued such a short time before the meeting, a thorough interpretation or analysis was impossible but the defense committee of the USITA will prepare an analysis of these orders based on the questions raised at the conference and this anaylsis will be available to the industry soon.

A report of the activities of the association was presented by President R. A. Phillips, Sioux Falls, S. C., in opening the conference. Such matters as priorities, taxation, tire rationing, and the formation of affiliated Signal Corps units were covered in detail. The effort which is being made by the association to see that the industry's facilities are in accord with the government's in the all-out war effort through proper representation in the capital and the set-up of what he called the "federal super-government" were explained by Mr. Phillips.

WPB's Communications Branch complimented the Independent industry by sending Bruce H. McCurdy, chief of that branch, and Graham Morrison, counsel of the branch, to the first day's session of the conference. Mr. McCurdy asked that the industry live within the priority rules and regulations and avoid asking for special consideration. Mr. Morrison and Mr. McCurdy were most cooperative in the assistance they offered to the telephone industry and explained that now that the Comunications Branch is well staffed with practical communications men its operation will be expedited.

Carl D. Brorein, Tampa, Florida, and Richard A. Lumpkin, Mattoon, Illinois, two Independent telephone executives who are now serving the Communications Branch as special advisers, were present at the open forums for priority discussions during the conference and answered questions from the floor.

A report on activities of the USITA's Washington office was given by Clyde S. Bailey, vice president of the national association in charge of its Washington office, in his address to the conference titled "Washington Affairs." Mr. Bailey made clear just how wide has been the scope of the activities of the USITA Washington office and the unusual demands which are now being handled there.

Mr. E. C. Blomeyer, vice chairman of the association's defense committee, led the discussion and forum on the three new WPB telephone priority orders.

The subject "The Telephone Industry's

USITA Secretary, Chas. C. Deering (left), telling the Association's President, R. A. Phillips and our Roy F. Smith his pet story.

Part in National Defense" was chosen by Lt. Col. William C. Henry, United States Signal Corps, and vice president of the national association, in addressing the afternoon session of the conference on April 28. In stressing the importance of the vital part which the industry is playing in the war emergency Col. Henry brought out three points on which the Army depends upon the industry: (1) furnishing of equipment and supplies; (2) supplying trained personnel for the Signal Corps; (3) providing communication facilities and service for both civilian and military needs efficiently. According to Col. Henry, Maj. General Dawson Olmstead, chief signal officer of the Army, has commended the telephone industry on its manner of meeting and dispensing with the demands placed upon it. Several of the Signal Corps units which are being formed and sponsored by the Independent telephone men have been completed and speed in completing formation of others was urged by Col. Henry.

THE activities of the associated tax committee was reported by J. F. O'Connell, its chairman, and Harold V. Bozell, New York City, gave a resumé of his testimony and that of John Porter, Tarboro, N. C., and John H. Agee, Lincoln, Nebraska, when they testified before the House Ways and Means Committee in opposition to the proposed increase in excise and corporate telephone taxes.

Louis Pitcher, executive vice president of the association, presided at the session held on the second day of the conference, April 29, in which reports of the association's standing committees were presented.

The report for the accounting committee was presented by I. J. Devoe, Lincoln, Neb., committee chairman, and showed that the association helped to secure the postponement for another year of the introduction of continuing property records regulations into telephone accounting by the Federal Communications Commission. Mr. Devoe recommended that telephone companies make sure that the accruals they are making for the payment of 1942 federal taxes are sufficient for the proposed increased taxes which might run 70 to 75 per cent higher than 1941 taxes. Ranford Dunlap, Fort Wayne, Ind., explained in detail the procedure for accounting for the costs of and taxes on construction of telephone facilities for Army camps and bases for which the government makes reimbursements to telephone companies.

F. E. Norris, Santa Monica, Calif., explained the arrangements for line load control which must be made by telephone companies to provide for preferential telephone service during emergencies of the war. K. B. Schotte, Jr., Kittanning, Pa., chairman of the plant committee, led this session of the conference.

RECOMMENDATION that telephone companies continue newspaper and direct-by-mail advertising in order to keep the public friendly and to explain the difficulties of rendering normal telephone service during the emergency was made by Lon J. Jester, Rockford, Ill., chairman of the commercial committee. Mr. Jester also suggested that telephone companies ask for the public's cooperation and understanding through the media mentioned above.

Fred Runkel, Madison, and Roy Siemund were good subjects for a poor photographer.

In one of the most interesting discussions of the meeting, E. M. Blakeslee, Madison, Wis., chairman of the toll compensation committee, reported on the activities of his committee. Parts of the report follow:

"The order of the Federal Communications Commission issued on June 4, 1941, reducing the interstate toll rates of the Long Lines Department of the American Telephone & Telgraph Co. by some $14,000,000, stipulated that both the associated Bell telephone companies and their Independent connecting companies should be made whole for any losses in revenue which would otherwise be experienced by those companies on toll traffic involving the Long Lines facilties.

"This 'make whole' stipulation of the Federal Communications Commission, however, has been of little comfort to the Independent company operating in those states where the Long Lines toll rate reduction of July 10, 1941, has been followed by similar reductions in the intrastate rates.

"The proportion of interstate traffic in the total delivery of the average Independent exchange is relatively small. In fact, it may be so small that a reduction in the interstate rate schedules will not affect the average revenue per message of the entire delivery sufficiently to bring that average within the next lower compensation block. But when rate reductions on interstate traffic are followed by corresponding rate reductions in the intrastate rates, the compensation and prorate earnings of the Independent exchange are directly and drastically affected.

"So far, there has been no evidence of a disposition on the part of the associated Bell telephone companies to make the Independent company whole on these intrastate rate reductions; yet, these reductions are a direct result of the American Telephone & Telegraph Co. having agreed to a reduction in the interstate toll rate schedules of its Long Lines Department.

"The A. T. & T. can and should create a receptive attitude in the minds of all of its associated Bell companies' managements and your committee recommends that the American Telephone & Telegraph Co. be requested to assume an active interest in this problem and constructively counsel with the managements of the associated Bell telephone companies to the end that the question of toll compensation will be promptly, harmoniously, and effectively dealt with."

Roster of California Association Available

Because of many requests, the California Independent Telephone Association has prepared a list of its membership, including the officials and employees of the member companies who have represented them in their contacts with the association. This is identified as "List No. 1."

List No. 2 shows the names of 'Associate Members and Their representatives.'

List No. 3 gives names of 'Non-Members—California Communication Utilities.'

List No. 4 shows 'Other Telephone Associations.'

List No. 5 gives names of 'Other Interested Persons.'

These comprehensive lists were prepared in order that anyone caring to could find the names and addresses of any and all persons and companies who are more or less identified with the association and have many interests in common with it.

War Stamps and War Bonds Mean More Guns and Bullets—Buy Often.

QUANTITATIVE DESIGN OF CENTRAL OFFICE EQUIPMENT FOR SMALLER TELEPHONE OFFICES

(Continued)

By JAY G. MITCHELL

Author's Note:—The decision as to the ampere hour capacity and the individual cell capacity is based, as has been shown, on the battery drain. The battery drain is directly fixed by the busy hour traffic and the twenty-four hour traffic and must be available to the designing engineer. The determination of the BATTERY DRAIN for any given busy hour and twenty-four hour traffic FOR ANY GIVEN TYPE OF EQUIPMENT is not properly a part of the Quantitative Design of the Central Office Equipment but is closely related to it. Because of some inquiries as to the method of determining the battery drain for a given type of equipment it seems proper to devote one installment of this series to the subject of central office Circuit Analysis. It is hoped that this deviation from the strict study of the subject of this series will not be found to be unwelcome by those who are following it.

In this special installment the analysis of Switchboard Circuits and the computation of the Battery Drain for given traffic data and given types of equipment is discussed — Concrete illustration of analysis method — Typical traffic data for an illustration — Typical Central Office Equipment circuits — Battery Drain to call operator — To supply talking power — To provide busy test — For the disconnect — Deductions found by experience to be allowable — Additional demands on the battery — Total net Battery drain per day — Comments.

Central Office Circuit Analysis

THE primary object of switchboard circuit analysis by the operating telephone company engineer is to make sure that the circuit under analysis is understood. In the factory where new switchboard circuits are being developed as a matter of routine the schematic switchboard circuits are analyzed to make sure that they will be safely operative. This preliminary circuit analysis in the factory is followed by actual tests in which the proposed circuit arrangements are set up with the proper apparatus and related circuits so that actual operation may be checked as to dependability, to insure the absence of marginal conditions that are not safely conservative, and other factors including the determination of the battery drain under commercial conditions. The engineer of the operating telephone company which is considering the purchase of new Central Office Equipment will not be concerned, presumably, with the positive operation of the switchboard circuits submitted to him. He may, in fact, leave the entire matter of operative circuits and relative battery drains to the manufacturers whose equipment will be given consideration but he may, on the other hand, feel responsible for these factors in the proposed equipment. When this is true it will be most helpful to him if he has an opportunity to devote the necessary time to such a study of the several switchboard circuits as will enable him, for his own satisfaction and profit, to intelligently pass on the operational details of the different systems. While such a check of the operational details of the switchboard circuits is being made it is very easy to determine the battery drain that the equipment under consideration will require per thousand completed calls. The manufacturers will probably be very glad to supply all this information if it is requested. In some cases, however, the operating telephone company's engineer may wish to make his own traffic determinations and with these data at hand proceed to make a confidential and thorough study of all the switchboard circuit arrangements submitted. In such cases the time required to analyse the circuits and apply the actual concrete traffic data to their operation will place such an engineer in the enviable position of being able to definitely recommend to his company certain equipment as the most suitable for the conditions to be met and **to support his recommendations with convincing arrays of facts.** For these reasons and others which need not be enumerated it is well worth the time and trouble to make a thorough analysis of switchboard circuits submitted.

Concrete Illustration

IN setting out an illustrative analysis of a switchboard circuit it is necessary, of course, to tabulate some reasonable traffic conditions. It is to be remembered that these traffic conditions **are not properly applicable to any telephone office** whatsoever except by coincidence. They are believed to be reasonably representative, however, of traffic in many medium size and small telephone offices. The point is that the results which will be developed are merely illustrative and **cannot safely be assumed** to be correct in any telephone office unless a careful determination of the traffic conditions in that office discloses the same set of data. The illustrative data some of which was listed in the discussion of battery capacity determination, is:

Operators answering time	5 seconds
Called subscriber's answering time	10 seconds
Actual conversation time	150 seconds
Disconnect (elapsed time after completion of conversation before connection is removed)	10 seconds
Total traffic (originating calls per day)	4500
Total calls busiest hour	390

In order to illustrate the method of circuit analysis by an example it is, of course, necessary to select some one type of switchboard circuit as an example. The method, illustrated by the application of assumed traffic data to a typical switchboard circuit, can then readily be applied by the designing engineer to any

type of Central Office Equipment submitted for consideration. It should be emphasized that circuit analysis is the accepted method of acquiring a knowledge of the operational features of any system of switchboard circuits from the schematic drawings. It is also true that the determination of the battery drain to be anticipated is a collateral result of the searching study of Central Office Equipment which should be made if possible prior to the decision as to the final selection. As an example of typical switchboard circuits for this purpose and referring to Fig. 1 the following physical data may be used:

Resistance of line relay A	2000.0 ohms
Resistance of line lamp	320.0 ohms
Resistance of cut-off relay B	34.0 ohms
Resistance of each repeating coil winding G	20.0 ohms
Resistance of supervisory relays C and D (combined windings)	10.7 ohms
Resistance of I	83.0 ohms
Resistance of J	40.0 ohms
Resistance (hot) of supervisory lamps H	120.0 ohms
Resistance of cord conductors, wiring, ec., each	5.0 ohms
Resistance of average line including circuit and telephone	180.0 ohms
Average battery emf.	24.0 volts

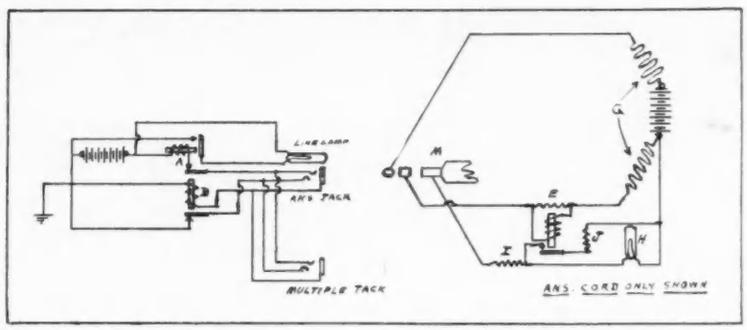
From the data assembled above the current flowing in each element of the equipment for each part of its operation in a completed originating call is determinable by Ohm's Law. The current flowing in each circuit path of the equipment, in amperes, is then multiplied by the number of seconds during which the individual portion of the operation for each call continues and the result is multiplied by the total number of calls to be handled during 24 hours. The results of such separate calculations when added together and divided by 3600 (the number of seconds in an hour) will represent the total ampere hours that will be required from the battery for the daily number of calls, assuming that the traffic for one day has been considered.

Ampere Hours Required To Call the Operator

REQUIRED for the Line Circuit. 2000 ohms (line relay) plus 180 ohms (circuit and telephone) divided into 24 (battery average emf.) and then multiplied by 5 (number of seconds the line current continues before the operator answers) and then multiplied by 4500 (total number of originating calls per day) is 247.706 **ampere seconds** or 0.06881 **ampere hours.** 320 ohms (line lamp) divided into 24 (battery average emf.) and then multiplied by 5 (number of seconds the line lamp glows before the operator answers) and then multiplied by 4500 (total number of originating calls per day) is 1687.500 **ampere seconds** or 0.46875 **ampere hours.** The number of ampere hours required, therefore, in the switchboard circuit shown in Fig. 1 is:

Line circuit and
line relay.....0.06881 ampere hours
Line lamp.....0.46875 ampere hours

To call the
operator .....0.53756 ampere hours



Ampere Hours Required To Supply Talking Energy

REQUIRED for both calling and answering cord circuits. 180 ohms (circuit and telephone) plus 40 ohms (two windings of the cord repeating coil) plus 10.7 ohms (combined resistance of inductive and non-inductive windings in parallel of the supervisory relay) plus 10 ohms (two conductors of each cord with associated wiring etc.) divided into 24 (battery average emf.) and then multiplied by 310 (10 seconds on the answering cord while waiting for the called party to answer plus 150 seconds actual conversation time on **each cord)** and then multiplied by 4500 (total number of originating calls per day) is 139094.055 **ampere seconds** or 38.6373 **ampere hours.**

Ampere Hours Required By the Busy Test

THE supervisory relay of the answering cord will, because of its connection with a line on which the receiver is off the hook, be operated. When the supervisory relays in this circuit are operated a shunt is completed around the supervisory lamp, extinguishing it. The joint resistance of the supervisory lamp and the shunt is equal to the product of their individual resistances divided by their sum or 40 times 120 divided by 40 plus 120, 30 ohms. Required for the answering cord busy test during actual conversation time plus answering time of the called subscriber. 30 ohms (lamp and shunt of answering cord in parallel) plus 83 ohms (resistance I) plus 5 ohms (cord conductor with associated wiring) plus 34 ohms (cut-off relay) divided into 24 (battery average emf.) multiplied by 160 seconds (actual conversation time plus called subscriber answering time) and then multiplied by 4500 (total number of originating calls per day) is 113683.680 **ampere seconds** or 31.578 ampere hours. The busy test for the calling cord, on the other hand, will be maintained under two different circuit conditions. The first is the period after the calling plug has been inserted in the called line jack but before the called subscriber has answered. During this period (assumed to be 10 seconds) the calling supervisory lamp glows, being extinguished subsequently when the calling supervisory relay is operated by the removal of the telephone receiver from its hook or cradle as the call is answered. Required for the busy test on the called line **before** the call is answered. 120 ohms (hot calling supervisory lamp) plus 83 ohms (resistance I) plus 5 ohms (cord conductor with associated wiring) plus 34 ohms (cut-off relay) divided into 24 (battery average emf.) multiplied by 10 seconds (called subscriber's answering time) and then multiplied by 4500 (total number of originating calls per day) is 4462.808 **ampere seconds** or 1.240 ampere hours.

Required for the busy test on the called line **after** the call is answered. 30 ohms (lamp and shunt of calling cord in parallel) plus 83 ohms (resistance I) plus 5 ohms (cord conductor with associated wiring) plus 34 ohms (cut-off relay) divided into 24 (battery average emf.) multiplied by 150 seconds (actual conversation time) and then multiplied by 4500 (total number of originating calls per day) is 106579.125 **ampere seconds** or 29.605 **ampere hours.**

Ampere Hours Required For the Disconnect

WHEN the conversation is terminated both supervisory relays are released. The disconnect requirement then coincides exactly, insofar as the circuit conditions are concerned, with the maintenance of the busy test on the calling line before the call has been answered.

Both supervisory relays have been released and both supervisory lamps are glowing. Required for the disconnect. 120 ohms (hot supervisory lamp) plus 83 ohms (resistance I) plus 5 ohms

(Please turn to page 38)

USE THEM Everywhere

. . . at docks, dry docks, firing ranges, warehouses, highway patrols, forestry and national park services, air fields, munitions and loading plants . . . in fact everywhere that intermittent telephone patrol service is required, the new Cook Pole Jacks provide compact, low cost stations for plugging in portable telephones.

Built to the rigid standards of the United States Army Signal Corps the No. 523-1 Pole Jack is equipped with the famous Cook Dual Gap Protector Unit that provides in addition to fusing both primary and secondary protection from lightning, power crosses and induced high potentials.

Unprotected types for either single or double plugs, built to the same high standards, are also available. Cook Pole Jacks are priced low through the adaptation and assembly of standard parts which are produced in large quantities for related products. The new Cook Pole Jacks are distributed by all telephone equipment manufacturers and supply houses.

COOK ELECTRIC COMPANY · 2700 SOUTHPORT AVENUE · CHICAGO

FRAME: The housing frame is hot dipped galvanized No. 16 gauge pressed steel and is equipped with a large non-corrosive ground stud. The detachable bracket for convenient mounting is also hot dip galvanized.

COVER: The non-corrosive cover is heavy welded zinc with drawn top. Tamper-proof hood seals can be furnished if desired.

JACKS: The new Cook Pole Jacks are furnished as standard with type JK–24 or JK–47 jack (U. S. Signal Corps designations) built to rigid U. S. Army Signal Corps specifications. Other jacks, as shown on Signal Corps drawing No. SC–D–553–G can be furnished when specified. An improved feature of the 523-1 Pole Jack is the spring cover for the jack opening which excludes dust, moisture and insects when the jack is not in use.

SIZE: The assembled unit is very compact, requiring only 25 cubic inches of space. It measures 6¼" x 2¼" x 1¾".

Type W

Type Z

Type G

Above are typical examples of AR rebuilt telephones. Your old instruments can be rebuilt to similar standards of excellence.

Here's o

to th

"AR" rebuilt service provides real factory rebuilding — it is distinctly not a repair shop! All equipment sent in — telephones, manual or automatic switchboards, P.B.X.'s, etc. — is completely dismantled, then entirely rebuilt from the ground up by expert craftsmen using factory machinery and methods—replacing used parts wherever required. The resultant equipment looks like new — and performs like new!

one important answer

to the telephone industry's "NEW ORDER!"

Wartime necessity has said, "Conserve your present equipment; make the utmost use of what you now have." It's an order of the day that manufacturers and operating companies alike will gladly observe to further the fight against the Axis.

Existing equipment must be kept in operation. And the better its condition, the better it will serve and the longer it will last. To properly maintain all of your equipment at efficient operating standards, we suggest utilizing "AR" rebuilding service.

It will pay you to start using AR rebuilding service long before your equipment actually becomes unusable. Make it a regular part of your long-term maintenance—select items to be sent in at regular intervals—and you'll be surprised how it aids you in maintaining operating efficiency. Working life is greatly lengthened, too—and prices are uniformly low. Write for further information—today!

NOTE: Because the character of our rebuilding service is such that it requires the use of new materials, priority ratings are necessary. Rebuilding service will usually qualify for priority under Preference Rating Orders governing repair and maintenance.

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ORIGINATORS AND DEVELOPERS OF STROWGER STEP-BY-STEP MACHINE SWITCHING AUTOMATIC DIAL SYSTEMS

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for VICTORY conserve VITAL MATERIALS

Help by rebuilding your old telephones the AR way. This magneto desk stand and ringer box for $7.75 plus your old equipment. . . . .

For the national economy and your own economy, send in your old desk stands and ringer boxes to be AR rebuilt. We strip them to the frame—then rebuild them, replacing all worn or defective parts. Without the AR tag to tip you off, you could hardly tell them from new! . . . If you have no equipment to send in, we'll ship AR rebuilt telephones from our stock. Write for prices.

AR Autelco Rebuilt

THE MARK OF QUALITY in REBUILDING SERVICE

AUTOMATIC ELECTRIC

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AMERICAN AUTOMATIC ELECTRIC SALES COMPANY
1033 West Van Buren St., Chicago, U. S. A.

Death Claims Herbert Edward Shreeve

Herbert Edward Shreeve, retired European technical representative of the Bell Telephone System, died at his home in Wyoming, N. J., on April 24, at the age of 69 years.

Mr. Shreeve was born in Cambridge, England, in 1873, and received his education in London. His first association with the Bell System came in 1895 when he joined the engineering department of the American Bell Telephone Company. Mr. Shreeve made many contributions to both the wire and radio telephone through devices which he developed and on which he held numerous patents. His was the first commercially successful telephone repeater. Direction of the installation of telephone repeaters on the first transcontinental telephone line was one of Mr. Shreeve's accomplishments, and he had the honor of being one of the first to talk over this line.

The first World War saw him in charge of research and inspection for the Signal Corps in Paris and his discharge from the army found him bearing the rank of lieutenant colonel. The Legion of Honor and the Distinguished Service Medal were both awarded to him.

He was staff engineer of the Western Electric Co. and later assistant to the president of the Bell Telephone Laboratories after the war. From 1926 until 1935 (the time of his retirement) he was the technical representative to Europe of the Bell Telephone System as mentioned above.

Mrs. Emily Loring Shreeve, his widow, and Prescott Shreeve, his son, both of Wyoming, N. J., are his survivors.

Rochester Company Reports

Net earnings of the Rochester (N. Y.) Telephone Corp. in 1941, available for interest and dividends, amounted to $1,079,873, an increase of $66,027 as compared to 1940, and fourth largest in the firm's history. This was shown in the company's annual report, which listed at $211,611 the amount to be added to surplus after meeting interest requirments, paying dividends, making an addition to its employees' pension trust fund and a reservation for the possible shrinkage in value of some of its assets.

Change to Common Battery

The Bellevue, Iowa, exchange of the Iowa State Telephone Company has installed new switchboard equipment in place of the magneto equipment used in the past.

THE PIONEER'S CORNER

Dear Mr. Smith:

Your recent establismment of "The Pioneers' Corner" in Telephone Engineer is very gratifying to members and officers of Independent Pioneer Telephone Association. I am accepting your invitation to Pioneers to make use of this column.

The Pioneers Association has decided, and I think rightly so, that times like the present make it all the more important that the kind of work the association is doing be continued. The Pioneers is an organization of which the purpose is to maintain the personal friendships and fellowship in the Independent telephone industry, and those are things we need now perhaps more than ever before.

One of the fine things about the Independent telephone industry is the fact that it leads to so many life-long friendships and to such pleasant personal associations. It is to this particular field that the Pioneers organization dedicated itself when it was organized many years ago. The work of the Pioneers in that regard has been of great personal value to many Independent people over these years.

It is particularly pleasing to one who has been a member of the Pioneers since the organization of that association, to see you giving the organization space in your valuable publication. I hope that your invitation to Pioneers to use the space will be accepted by many of them.

The activities and results of the Pioneers association will in this way be made known to many eligible Independent people who are not now members, but who should be—and who would have pride and pleasure in their membership. I hope that all of them will give thought to the benefits to them of such membership.

The dues are so small that they need not deter any eligible Independent man or woman from joining. Besides the insurance provided for every member, the other benefits are worth many times the cost.

Very truly yours,
E. C. Blomeyer

TOOLED-UP
to Maintain America's Lines

America's lines of telephone communication now carry a greater responsibility than ever before. And, today's lineman must stand equipped to do the finest, fastest work. A great deal of his efficiency depends upon the quality and design of the tools he uses. That's why leading independent telephone companies choose GRAYBAR as the logical source of tools. They know that the tools they buy from GRAYBAR are not only designed for the job, but that their performance has been pre-tested under actual field conditions by leading companies who buy via GRAYBAR.

So, next time you need anything along the line, remember to call on your local GRAYBAR Representative. You'll be sure to get quality products and cooperative service no matter how large or small the item.

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Conducted by B. C. BURDEN, Technical Editor

Line AND Desk

Q. If the generator of a magneto telephone turns exceptionally hard with the telephone disconnected from the line, what is likely to be the trouble?

A. This would indicate that there is a short across the terminals of the generator, assuming of course that the generator has been properly lubricated. Quite frequently the insulating bushings of the generator shunt springs may be carbonized and this will short out the generator causing it to turn hard. By disconnecting one wire from the generator, it can be determined whether the short is in the generator or external to it.

Q. What is the correct method of replacing a broken or decayed pole?

A. Set the old pole to one side of the hole, dig out the butt and make sure the hole is the proper depth. Place the new pole and then transfer the attachments from the old to the new pole.

Q. Is there any way in which the loss due to eavesdropping subscribers on rural party lines can be eliminated?

A. The loss of the party line eavesdropper can be greatly reduced by equipping each set with a hook latch which in the non-operated position causes a 3000 ohm resistor to be cut into the receiver circuit. When the hook latch is operated the resistor is shorted out. The resistor reduces the shunt loss imposed by a listening telephone but still permits the eavesdropper to listen though at a reduced volume. For example, with three eavesdroppers the loss is normally 9.0 db, but if all telephones are equipped with the hook latch and 3000 ohm coil the loss would be only 2.1 db.

Q. Why are inequality ratio repeating coils sometimes used in cord circuits?

A. Inequality ratio coils are sometimes necessary to match the impedance of a trunk circuit and an exchange circuit, for example a loaded cable trunk circuit would have a much higher impedance than a non-loaded exchange circuit, hence, there would be a reflection loss unless the repeating coil windings are of such ratio as to match the unequal impedances.

Q. What is the minimum separation recommended between crossarms?

A. Standard clearance between arms is 24 inches. However, where it is necessary to get additional road clearance without changing an existing pole, it is permissible to reduce the clearance to 18 in. and if this is not enough, the clearance should be reduced to 12 in. Use reduced clearance only where necessary.

Q. What size nails should be used in attaching a bracket to a pole?

A. A 60 d. nail in the upper hold and a 30 d. nail in the lower hole.

Q. Why are 135 cycle ringer systems needed on long distance toll lines?

A. 135 cycle ringer systems are used on some toll lines in order that composite telegraph circuits can operate on the same line. If a 20 cycle ringing circuit were used it would interfere with the telegraph circuit whereas by using a higher frequency ringing current it can be prevented from passing into the telegraph system by means of filters.

Q. Is loading practical as a means of reducing the high attention of a 22 ga. farm cable 4 miles in length?

A. Yes, it is now possible for Independent companies to purchase loading coils which will greatly reduce the overall attenuation on long farm cables. The coils generally used for this purpose have an inductance of 88 millihenries and are spaced at intervals of either 6000 or 9000 ft. The coils are potted in steel cylindrical cases which can be mounted on a pole in much the same manner as a cable terminal.

Your Questions are answered FREE. If you wish an immediate mail reply enclose self-addressed stamped envelope with your question.

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Q. Does a loaded cable have a better frequency response characteristic than an unloaded cable?

A. A loaded cable has a flatter and more uniform frequency response over a fixed range. However, the loss increases very rapidly above the cutoff frequency. In general the heavier the loading the lower the cutoff point.

Q. How much loss will 3 eavesdropping subscribers on a 14-party rural line create to a 4th party using the line?

A. It is difficult to say what the exact loss would be as this will depend on the position of the eavesdropper and the legitimate user of the line, but roughly it would be 7 decibels.

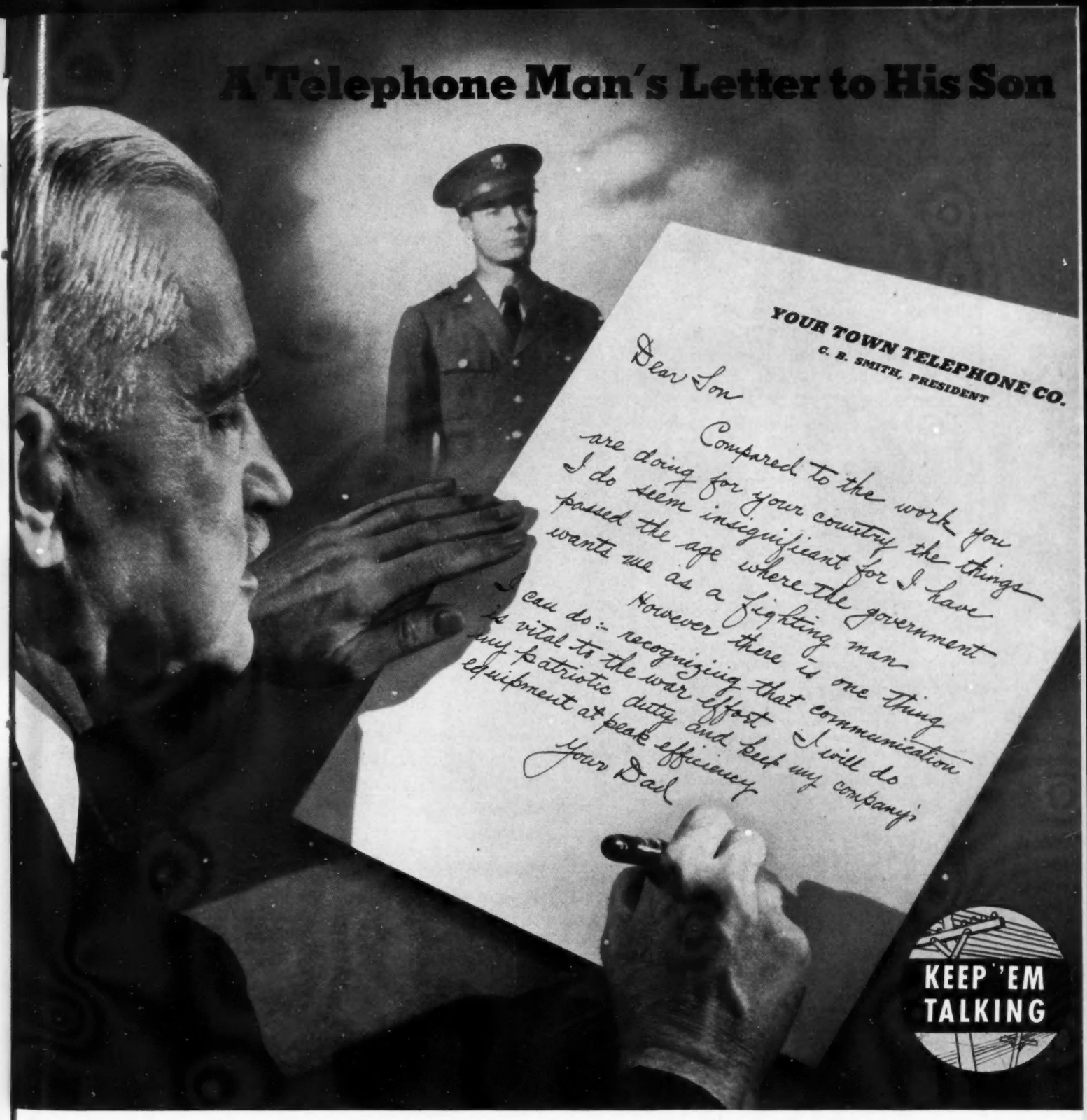
Q In a recent article I read that the A.C. resistance of a typical telephone receiver is approximately 125 ohms whereas the D.C. resistance is 80 ohms. I do not understand the difference between A.C. and D.C. resistance. Please explain.

A. **D.C. resistance** represents the actual ohmic resistance of the wire in the receiver coils when measured on a Wheatstone Bridge or with a direct reading ohmmeter. **A.C. resistance** represents not only the ohmic resistance but also the added resistance due mainly to power losses resulting from eddy current and hysteresis effects. These effects make an electro-magnetic circuit have a higher resistance than a simple resistance measurement would indicate. Hence, in alternating current computations the A.C. or **effective resistance value** must be used rather than the D.C. value.

Q. Is it permissible to use a drop wire clamp attached to a metal hook on a wooden building?

A. No, the drop must be insulated at all supports on a frame structure.

A Telephone Man's Letter to His Son


YOUR TOWN TELEPHONE CO.
C. B. SMITH, PRESIDENT
Dear Son
Compared to the work you are doing for your country the things I do seem insignificant for I have passed the age where the government wants me as a fighting man
However there is one thing I can do: recognizing that communication is vital to the war effort I will do my patriotic duty and keep my company's equipment at peak efficiency
Your Dad
KEEP 'EM TALKING

YOUR COMPANY IS AN IMPORTANT LINK in the chain of telephone communication. Keep your equipment in good working condition, equal to meeting any emergencies that may arise, for, today, telephone communication is more important than ever before.

We at Stromberg-Carlson are bending every effort to cooperate with you by keeping on hand adequate supplies of those materials permitted by priorities.

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Stromberg-Carlson

INFORMATION for USERS of TELEPHONE WIRE and CABLE

Two important commodities entering into the manufacture of Telephone Wire and Cable were obtained largely from territories now occupied by the enemy. As of course you know, the principal sources of rubber and tin were Malaya and the Netherlands East Indies, now in Japanese hands.

In Telephone Wire and Cable, rubber is used for insulation, tin as a protective coating on rubber covered conductors and as an aid to soldering on certain other conductors.

Phillips metallurgists have developed alloys requiring smaller quantities of tin than before, and our rubber chemists have perfected compounds using reclaimed rubber instead of new crude rubber. This does not altogether solve the problem, however, and the situation may be worse in future.

Our only reason for explaining these matters is to help our customers get the maximum benefit from the available materials. Here is what you can do to help yourselves and us:

1. **Avoid purchasing rubber covered wire for which bare wire or wire having another type of insulation can be used.**
2. **Obtain the maximum life from your present wire installations by reclaiming any good wire taken from one installation and using it elsewhere.**
3. **Use your present warehouse stocks of rubber covered wire as sparingly as possible.**
4. **Instruct your installers to use extra care in soldering either tin alloy coated wire or wire without any coating. Ordinary equipment and fluxes will do the job.**

PHILLIPS WIRES and CABLES

General Distributors:
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Sales Offices: Ottawa, Hamilton, Edmonton

EXPORT DISTRIBUTORS:
AUTOMATIC ELECTRIC SALES COMPANY, LIMITED, CHICAGO

Note These Advantages of a Motor-Driven Calculagraph

If you are still using spring-drive Calculagraphs, you would find it advantageous to substitute the more modern *electrically* operated models.

Model No. 33

They eliminate winding the main spring. No regulating is required as they are automatically kept at the correct time. Reading of elapsed time of toll calls is more simple.

Electric Model No. 33 is very compact. It measures only 7½" x 3⅜" and weighs but 8 lbs. Gives full vision of dial from any position on switchboard. Operates on regulated current.

The Calculagraph prints the exact elapsed time of toll calls in minutes and seconds and the time of day the conversation began.

Model No. 6

May we send full particulars about the Calculagraph? Write today.

CALCULAGRAPH CO.

308 SUSSEX ST. HARRISON, N. J.

CALCULAGRAPH
Accurate Toll Timing to the Second!

Personals from the Field

Carl D. Brorein, President of the Peninsular Telephone Co. of Tampa, Fla., was elected a vice-president of the United States Chamber of Commerce at its annual convention held in Chicago recently.

•

C. H. Welborn formerly with the telephone company at Garnett, Kansas recently moved to Richmond, Kansas to accept a position with the Richmond Telephone Company.

•

Gullick Tollefson, age 70, manager of the Corning, Minn., Farmers Telephone Company for the past thirty years was killed May 1. Mr. Tollefson was repairing a line when the telephone pole he was repairing fell on him, breaking his neck and killing him instantly.

•

H. L. Cross reports that he has sold the Crocker and Dixon, Mo., telephone exchanges to **H. H. Hillyer** of St. Louis. Mr. Cross expects to remain in charge of the Crockett exchange.

•

E. S. Schrupp, manager of the Sheffield-Chapin (Iowa) exchanges of the Central Electric & Telephone Company is reported to be in training with the army at Fort Des Moines.

•

Kirk Thompson, blind manager of the Crescent Telephone Company, Erie, Illinois, for the past forty years, is retiring from active service this month. He will continue as a director of the company. **Claude Davis** will assume management upon Thompson's retirement.

•

Mrs. Cecil Harris was recently named manager of the Braggs (Okla.) Telephone Exchange. Mrs. Harris was manager of the Salisaw office until she moved to Weleekta to reside three years ago.

•

J. F. Stedwell, superintendent of the Hastings (Minn.) Telephone Company died April 3, after an illness with which he was stricken three weeks previous.

•

Fire recently destroyed the Southern Continental Telephone exchange housed in the home of **Mrs. Mamie Bland,** Glendale, Kentucky.

•

Announcement was just received that **Mr. and Mrs. W. E. Weaver** have assumed charge of the Dwight (Kansas) Telephone exchange.

•

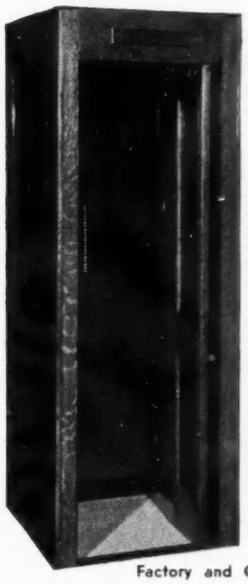
J. W. Longwell, for 41 years manager of the Van Wert (Ohio) Home Telephone Company died April 23 at the Van Wert County Hospital from a heart ailment. He was 77 years old and had lived in Van Wert all of his life.

•

C. T. Adair, formerly of Oklahoma City, Oklahoma, has taken over the ownership of the Star City Telephone Exchange which he recently purchased from the Southeast Arkansas Telephone and Power Company.

•

Burtis A. Green, secretary of the Jamestown (Kansas) Telephone Company, who had been ill since the first of the year died of a heart ailment April 16.



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Your Pay Station Business With an Attractive

CHURCHILL TELEPHONE BOOTH

The CHURCHILL No. 100 Folding Door Telephone Booth is built as a single unit and equipped with a reinforced back panel for mounting a wall telephone or coin collector. Made of selected white oak, finished light or medium oak; or of birch, finished light or medium mahogany. Electric light and electric automatic ventilator are standard equipment. Finished inside and out with stain, shellac and lacquer, in a beautiful satin finish. Booth has no floor. Overall height, 84¾"; width 29"; depth 30½". Shipped knocked down and crated. Write for literature about this and other CHURCHILL telephone booths.

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A POWERFUL RINGING CONVERTER

Has Proven Its Efficiency Under Most Severe Operating Conditions

Sub-Cycle is built for heavy duty — requires no routine maintenance — cannot interfere with radio reception — is economical in operation — and quiet — output voltage regulation between no load and full load is very close. In it there are NO MOVING PARTS TO ADJUST.

MANUFACTURED IN SIX MODELS FOR LOADS RANGING FROM SMALL PBX TO THE LARGE CENTRAL OFFICE

ALSO PULSATORS

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NEW!

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SELF-CONTAINED
Dial Type Prepay
GRAY PAYSTATION

Houses Everything But the Ringer

THE design of the future, but here today! Incorporates A. E. Co. Type 40 High Fidelity, Anti-Sidetone Circuit, Handset, Dial and all ringer box components except the ringer.

By using the ringers in your old boxes, you can save money for yourself and also help Uncle Sam conserve needed war materials.

Fully automatic prepayment on local calls, with operator in complete control of collections and returns on long distance calls. Dual coin switch affords double protection against fraud. It's the correct equipment for smart, up-to-date service. Details on request.

NOTE—The Government's 6% excise tax is NOT assessed on unattended pay station calls.

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Graybar Electric Company
Kellogg Switchboard & Supply Company
Leich Sales Corporation.
The North Electric Mfg. Company
Stromberg-Carlson Telephone Manufacturing Company

IN CANADA:

Canadian Telephones & Supplies, Limited
Northern Electric Co., Limited

THE GRAY MFG. CO.
HARTFORD, CONN.

Indiana Telephone Association Holds 23rd Annual Convention

ALL telephone men of the Hoosier state can be proud of the 23rd annual convention of its association, held May 6-7, at Indianapolis. The speakers, both in open sessions and in conferences addressed full houses.

A Panel Discussion under the direction of Association president, R. V. Achatz of Aurora with the following participants was the feature of the opening session, Wesdnesday morning: W. J. McWilliams, F. O. Cuppy, R. F. Lucier, F. J. Baker, W. J. Scheidler and W. H. Beck.

Vice-President. R. V. Pontius,

The Honorable Henry F. Schricker, Governor of Indiana, addressed the luncheon gathering, stressing the necessity of patriotism during these times. Without adjouring from luncheon the afternoon program continued with Francis X. Welch, associate editor of Public Utilities Fortnightly, giving a timely insight on "Washington and the Telephone Industry under the Emergency."

Lt. Col. Wm. C. Henry found a very interested audience in his discourse on the signal corps, their importance and formation.

With the assistance of W. H. Beck, general manager of the Association, Lt. Col. Henry made nice progress in the formation of a Signal Corps unit which the Indiana association is sponsoring.

R. V. Achatz, Aurora, president; W. H. Van Horn, Logansport, vice-president; and W. H. Beck, Indianapolis, secretary and general manager.

The Banquet guests were entertained by a humorous talk on "Dealers Choice" by Jeff H. Williams of Chichasha, Oklahoma.

The morning session of the second day opened with the officers' reports and continued with convention business and re-election of present officers. Louis B. Pitcher, vice-president of the USITA spoke on the "National Picture"—giving his listeners an idea as to what they might expect in legislation in the near future.

The Open Forum following was well attended and most interesting as well as instructive. The Traffic Meeting was also well attended and ably conducted by George A. Steele of United Telephone Company and Vaun Flora of Indiana Bell Telephone Co.

SUB-CYCLE

MASTER RINGING CONVERTER

Install It—
Then Let It Alone

**There's — NOTHING TO ADJUST
NO MOVING PARTS—NO
ROUTINE MAINTENANCE**

SUB-CYCLE is as near fool-proof as can be made. Designed to deliver years of Trouble-Free Service at Low Operating Costs.

BUILT FOR HEAVY LOADS

6 Models from Small PBX to Large Central Office.

•

Also PULSATORS

Sold by Leading Distributors

THE LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

Appointed to Signal Corps

Peter L. Schauble, Vice President of the Bell Telephone Company of Pennsylvania, has been appointed Special Assistant to Major General Dawson Olmstead, Chief Signal Officer, Signal Corps, U. S. Army. His duties will be in connection with a program to attract to the Signal Corps the high type technical personnel required to meet the demands of modern warfare.

"This is not only a global, but it is also an amphibious war," said General Olmstead, "and the Signal Corps must attract technical minds of the very highest calibre. We are planning a program to accomplish that purpose."

Mr. Schauble was appointed Vice President of the Pennsylvania Bell in charge of Public Relations in 1941 after nearly 30 years service with the Company. At the close of World War 1, he wrote the history of the so-called "First Battalion," which was the first of the telegraph battalions organized by the various Bell Telephone Companies at the start of the War in 1917.

In his present work for the Signal Corps, he will be associated with Colonel C. O. Bickelhaupt, who was Vice President of the A. T. & T. Company before being called to active duty in the Signal Corps.

Priority Round Table at New York Convention to be Conducted By F. Heyes of Kellogg

The subject of priorities looms more and more important in the every day business of telephone men. Mr. Frank Heyes, head of Kellogg Switchboard and Supply Company's Priorities Service Department was therefore asked to address the meeting of the New York State Telephone Association to be held at Syracuse New York, May 25th and 26th.

Mr. Heyes suggested that a round table discussion be held instead of his delivering an address. He based his suggestion on the fact that individual telephone men all have particular questions regarding priorities and their business, and that each would benefit more if he could answer their specific problems. This round table discussion will take place on the morning of May 26th.

What with the new priority rulings issued to the telephone industry, and Mr. Heyes' first-hand knowledge of the priorities situation, gathered from conferences in Washington, this should prove to be a lively profitable meeting for those attending the New York convention.

New President of USO

Chester I. Barnard, President of the New Jersey Bell Telephone Co., since 1927, and an outstanding leader both in telephone administration and civic affairs, was elected President of the United Service Organizations April 28.

Mr. Barnard succeeds Harper Sibley, former U. S. Chamber of Commerce President, who resigned. He becomes head of the USO as the agency began a campaign May 11 to raise a fund of $32,000,000 to continue its work.

The New Jersey Bell President has long been a leader in civic enterprises. He served as the first state director of Emergency Relief for New Jersey from 1931-33, and acted as special assistant to Secretary of the Treasury Henry Morgenthau, Jr., for several months last fall. He will take a year's leave of absence from his post with the New Jersey company, and will serve as USO head without compensation.

Quoted from the May, 1917 issue of TELEPHONE ENGINEER: "Did you ever stop to think that without elevators and telephones there could be no skyscrapers?"

Ironite

The Better DROP WIRE

Again proves itself as a conserver of vital war materials. Meets all demands for efficient service . . .

Unusual Strength — **High Dielectric Insulation**
High Conductivity — **Easy Workability**
Long Life — **Moderate Cost**

Made, for 37 years, by
PARAGON ELECTRIC COMPANY

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PAGE & HILL CEDAR POLES

for — Long Dependable Service at Low Cost

P & H Northern White Cedar Telephone Poles—Standard of the industry for 41 years—now available with an amazingly effective, LOW-COST protection against sapwood decay and termites. P & H "PENTA" POLES are full-length treated with a preservative many times more toxic than others in common use. As distributors, we recommend them.

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Quantitative Design

(Continued from page 26)

(cord conductor with associated wiring) plus 34 ohms (cut-off relay) divided into 24 (battery average emf.) multiplied by 20 seconds (10 seconds for the answering cord and 10 for the calling cord) and then multiplied by 4500 (total number of originating calls per day) is 8925.616 **ampere seconds** or 2.481 **ampere hours.**

Total Battery Requirement

FOR the operational requirements of this switchboard circuit and traffic conditions the computed total as disclosed is:

To call operator	0.538 ampere hours
To supply talking current	38.637 ampere hours
Busy test (answering cord)	31.578 ampere hours
Busy test (calling cord)...	1.240 ampere hours
Busy test (calling cord)...	29.605 ampere hours
Disconnect	2.481 ampere hours
Computed total...104.079 ampere hours	

This total is too great for the operation of this type of equipment under any actual conditions however. There are always a considerable number of uncompleted calls such as don't answers, busy lines, wrong numbers, and out of orders, while trunked calls to the toll switchboard, the wire chief and the chief operator are not only likely to be of shorter duration but in many systems require no talking current to be supplied to the calling cord. In most exchanges these factors are sufficient to justify the elimination of about 7% of the computed battery requirements. On the other hand the operators, wire chief's and chief operator's telephone sets, pilot lamps and ringing converters impose drain on the battery which has not been contemplated in the above computation. In the usual telephone office it is safe to deduct 5% because of these collateral additions and reductions and on that basis the estimated current consumption of the imaginary office will be reduced to 104 ampere hours per day less 5 ampere hours or 99.0 ampere hours.

Comments on this Method

THERE will be some difference of opinion among telephone executives as to the worth of this method which is unquestionably tedious in execution. The answer to such criticisms is that it is necessary to make certain arbitrary assumptions of traffic conditions in order to compare different switchboard systems because in actual practice the traffic conditions can never, with certainty, be exactly duplicated otherwise. In addition to this undoubted fact it is true that such a searching analysis of Central Office Equipment characteristics will place the designing engineer in position to intelligently compare the systems offered for consideration. This is because his analysis and computation of the battery drain will surely place in his mind an accurate understanding of the operation of the system so that nothing need be taken for granted in that respect.

"Worst storm I've ever seen!"

"Yes, good thing we used

AMERTEL

for these lines"

And right there you have one of the big reasons for the tremendous popularity of Amertel "85" and "135." Its high tensile strength provides a greater safety factor and assures unimpaired service, even under the heaviest loads.

Telephone men in all loading districts have found long spans are not only possible but entirely practical with Amertel. *That's* something worth knowing when you're putting up a line.

USS Amertel TELEPHONE AND TELEGRAPH WIRE — AMERICAN STEEL & WIRE COMPANY

DISTRIBUTED BY

AMERICAN AUTOMATIC ELECTRIC SALES COMPANY

1033 WEST VAN BUREN STREET · CHICAGO, ILLINOIS

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Specify PUTNAM LADDERS

Carried in stock for immediate delivery.

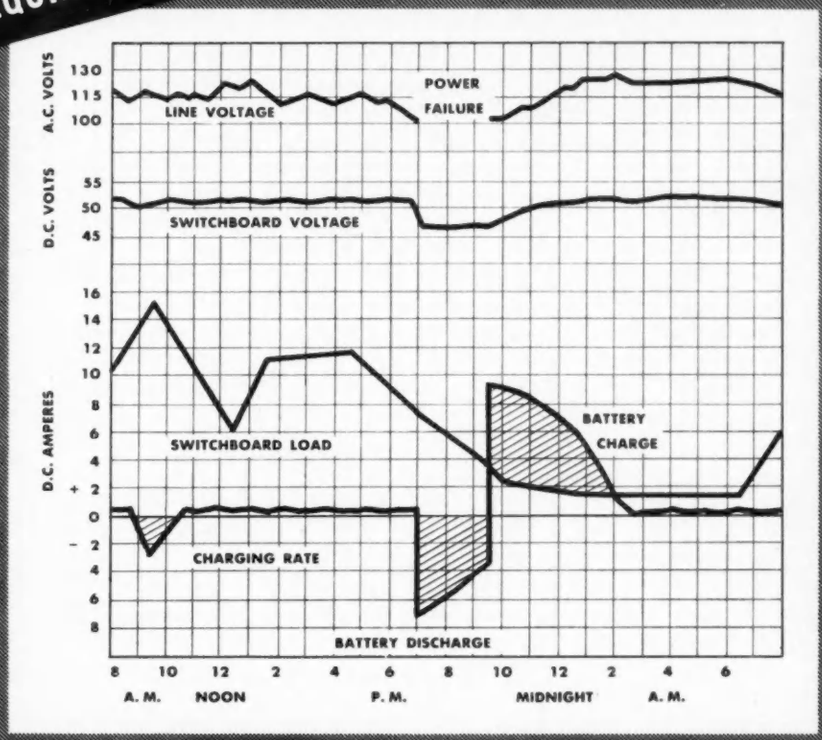
We make and sell more rolling ladders than all other makes combined.

PUTNAM & COMPANY, Inc.

USED THROUGHOUT THE BELL SYSTEM

PUTNAM & COMPANY, Inc. 32 Howard Street, New York, N.Y.

RAYTHEON RECTICHARGER MEETS EVERY REQUIREMENT FOR TELEPHONE DC POWER



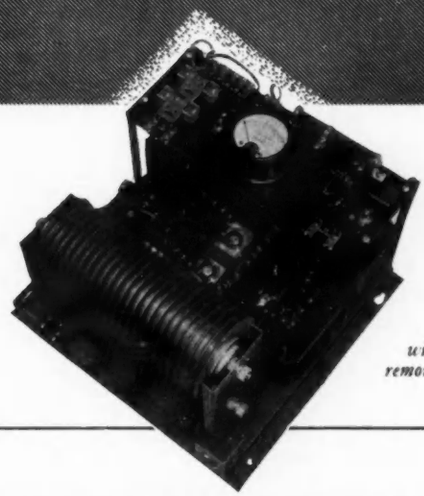
Everyone wants Constant Potential Charging because it insures the best possible telephone operation and because it charges the storage batteries under conditions favorable to maximum life.

The chart shows how the Raytheon RectiChargeR meets every telephone requirement for Constant Potential DC under all operating conditions.

1. NO LOAD
2. VARIABLE LOAD
3. OVERLOAD
4. VARYING AC LINE VOLTAGE
5. AC INTERRUPTION

All of this is accomplished without moving parts and makes the RectiChargeR ideal for unattended operation.

We will be very glad to send you further information or answer any specific questions that you may want to ask.



View with cover removed

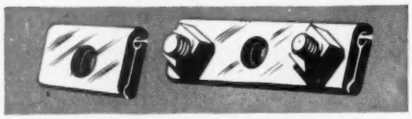
RAYTHEON

Manufacturing Company

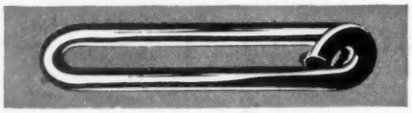
134 Willow Street, Waltham, Massachusetts, U.S.A.

. . . from the
COMPLETE LINE OF
OLIVER
POLE LINE MATERIALS

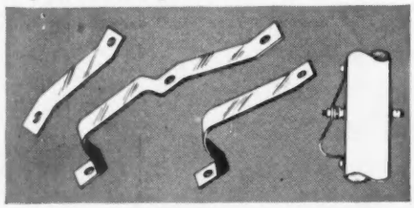
CABLE MATERIALS
Specialized for Telephone Lines



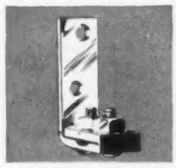
Cable Suspension Clamps are made in two styles—one- and three-bolt. Both will take strands 1/4 to 7/16 inches diameter.



Reinforcing Links relieve side strains at angles in the line. Fastened by lag screws on each side of Cable Suspension Clamps.



Reinforcing and Safety Straps are of three styles: one to support the messenger bolt; one to prevent the Cable from pulling; one a combination of the other two.



The curved groove of the Universal Messenger Hanger allows it to be used at corners as well as on straight runs. Forged from 1/2 x 2 inch open hearth steel.

Shown above are some of the more popular Oliver Cable materials. Forged from mild open hearth steel, they are accurately made, sturdy, dependable. All items are protected by a heavy hot dip galvanizing coating.

OLIVER IRON AND STEEL Corporation
Makers of Pole Line Hardware Since 1894
PITTSBURGH, PENNSYLVANIA

SEEN AND HEARD at the Executives' Conference

F. H. Runkel of the Commonwealth Telephone Company, Madison, was an interested listener to the paper prepared by **F. E. Norris** of the Associated Telephone Company, Limited, Santa Monica. Lineload is something we must prepare for.

•

Hello there **Jim Moran!** He is up from Portsmouth (OHIO) Telephone Company attending the conference . . . and there is his boss **Allen S. Crane** with the usual smile on his map.

•

Your editor had lots of fun taking camera shots at the conference but regrets the one of **Oscar Burton** of Texas and **F. R. McBerty** of Ohio just didn't pan out. Nope it wasn't the fault of the subjects and I haven't had time as yet to read my book and find out which gadget I forgot to operate.

•

Sam H. Shutt of the Texas Telephone Company, Sherman, is another Texan who enjoys and can stow away a thick steak.

•

Lincoln Tel. & Tel. Co's., **Agee, McCulla, Devoe, Brewster** and **Behm** could have received attendance prizes as they were present at every session of the conference.

•

E. C. Blomeyer is one question answerer that believes in assistance. He could hardly have secured better ones than those who aided him during the open forum on the new orders 1-50, P-29 and P-130.

•

Our own vice-president, **Don C. Sorensen,** was a little late for the opening session. He was attending the Kellogg Switchboard 45th birthday party that morning.

•

USITA president, **R. H. Phillips** and vice-president **Louis Pitcher** have to take a back seat to secretary-treasurer, **Chas. C. Deering** when the latter unslings his fog-horn voice to open the sessions. Several "mooed" back at him but their voices were lost in the echo.

•

Carl Brorein and **R. H. Lumpkin,** USITA directors and special advisors to the head of the telephone section of WPB were available to aid in the open forum on new orders. They must spend lots of time in Washington on this job they volunteered to do . . . and are doing so nicely.

•

Chas. F. Mason, president of Associated Telephone Company, Ltd., led a group of four from his California company. Invitations to the California Convention were delivered in person. We missed **Eliot Cheadle, Harlan Holmwood** and **George Blake.**

•

It would have to be **John H. Wright** of Jamestown, N. Y., a noted photographer himself, who would be posing for our flash camera when our last bulb, a dud, caused us to fizzle. We did get a dandy of him at the National Convention last fall, though.

•

George Kloidy, secretary of the Nebraska Association pleased us by smiling at the "birdie" when we aimed the camera at him. **Arch MacKinnon** of New York Association is photogenic. Watch out Hollywood.

•

TELEPHONE ENGINEER's Technical Editor, **B. C. Burden** could not attend. He is the telephone engineer in charge of installing the telephone system at the WAHOO, Nebraska, Ordnance Plant.

•

Roy Seimund says those in the last draft registration will probably be placed in the parachute troops—you'll have to get the reason from Roy, personally.

•

Glad to see you in these parts, **J. T. Naylor,** Chas. F. Mason's right hand man.

•

Durham, North Carolina's favorite son, **R. Van Trine,** renewing acquaintances.

•

Maurice Sellers, the advertising specialist, with his usual smiling countenance. Glad the daughter is recovering so nicely from her recent accident, Maurice.

•

R. A. Phillips, USITA Prexy, was as busy as a bee—but had time as usual, to get around and shake hands with everyone.

"I've Inspected Drop Wire
...a thousand miles of it and more... and for "Specifications Plus" Quality, I'll take my hat off to Monotype. Full 17 gauge; full .109" over the insulation; close, tight braid and A-I in impregnation and pitch-and-mica finish. Never less than full 200 lbs. on tensile test ...They just don't come any better."
The Voice of A Wire Inspector
MONOTYPE
DROP WIRE
Manufactured by
GENERAL CABLE CORPORATION
Monotype Drop Wire
With the Copperweld Conductor
'17 TWISTED PAIR
109

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"COPE"

It's the name behind the Product that counts

AERIAL EQUIPMENT

CABLE HANGERS
AERIAL FEEDERS
SLACK PULLERS
PULLING SWIVELS
COMPOUND KETTLES

For a period of over fifty years "COPE" has stood for quality in workmanship and design. We have pioneered many of the features in cable installation equipment which today have become standard in most of the principal Telephone Companies, Central Stations and Municipal Plants throughout the country.

WRITE FOR CATALOG

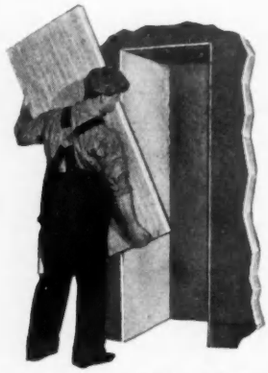
T. J. COPE, INC.
6120-6122 VINE STREET
PHILADELPHIA, PA.

Telephone Booths for Greater Revenue

By D. W. DAY,
Burgess Battery Company

NOW that Government restrictions make it difficult for telephone companies to extend certain types of telephone service, these sources of new revenue have been cut off. Under these restrictions many operating telephone companies are encouraging the public to make greater use of present pay stations by installing special booth equipment that will enhance the value of the pay-phones to the public.

Actual experience has shown that this attitude can be changed. Most pay station users want to be able to telephone in a place where their conversations will not be overheard by others, and where noise will not cause interference. Moreover, it has been found that an attractive pay station makes it easier to show a proper return in a long established "free" location, as the public naturally resents being asked to pay for telephone service which has always been gratis.



Acoustical panels for relining old booths.

Doorless booth with sound absorbing lining.

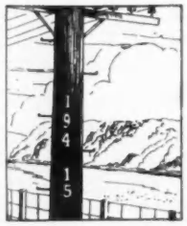
Another example of a modern telephone booth lined with sound absorbing material.

One simple way to increase revenue is to move pay stations from unprofitable locations to new locations that offer greater potential income. In fact, where new areas are developing due to defense industry, a conveniently located pay-station may be the only means of serving many residences in that area because of Governmental restrictions on new residence telephones. However, before removing an unprofitable pay-phone to another area, it is advisable to first find out why the station is not paying as well as it should. Many stations which are unprofitable may be operating at a loss because the telephone is installed in an open area where no privacy is provided for the patron. Usually when such installations have not produced sufficient revenue, the policy has been to remove the instrument without making further efforts to increase the revenue from that location.

Some progressive telephone companies have found that, to make the pay station attractive and inviting to the public, it is necessary to do more than merely provide a telephone instrument. For example, take the case of a location where a storekeeper has permitted his customers to use his private business telephone without charge. Of course, the telephone company derives no added revenue from such "free calls". It is difficult to make a pay telephone

STOP
Wasting Time and Money In Stenciling -

There Is a Better Method That Saves Labor and Costs



With labor at a premium, this is no time to waste time with brush and stencil. Premax Metal Numbers, Markers and Tags cost less to install, have greater visibility, and outlive the ordinary pole. Change over now — make this saving.

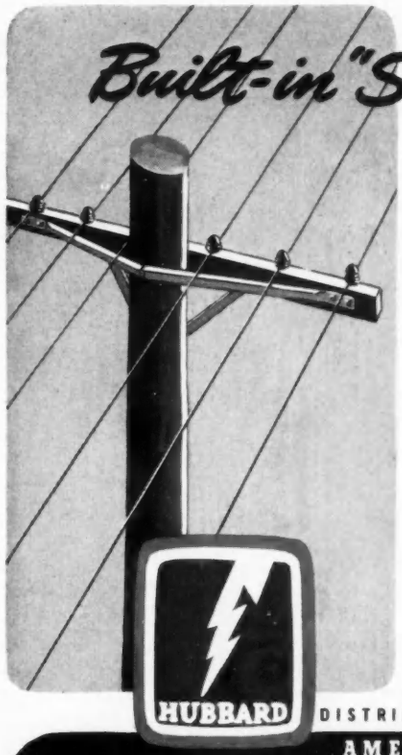
Premax Products
Division Chisholm-Ryder Co., Inc.
4210 HIGHLAND AVE., NIAGARA FALLS, N. Y.

overcome the usual hesitation of a storekeeper to change from "free" to "pay" service. The storekeeper quickly sees the improvement that an attractive booth will add to his premises and senses that most customers will not object to paying for calls when complete privacy is offered for the telephone call.

All the manufacturers of telephone booth equipment have realized the shortcomings of the old-style booth and many attempts have been made to remedy them. Our company, Burgess Battery Company, has developed a booth structure with special acoustic walls. This permits the combining of privacy with comfort in a booth by making use of a principle of noise-absorption. This booth has no doors. Furthermore the acoustic lining "blots up" noises coming from outside of the booth which might otherwise make it hard for the booth patron to hear what is being said to him over the telephone.

We have discovered upon investigation that most companies find the re-installation of old, discarded booths to be poor economy. There is little choice between making a call over a storekeeper's telephone, located on a counter, or making it in a booth with a wall providing so little sound insulation that everyone in the store can overhear the occupant's conversation. Any plan for increasing revenue will give maximum success only where the pay station is actually made attractive and serviceable to the patron. Proof of this fact is shown by the records of one district manager, which show that modernization of the pay station facilities at one location with an acoustical booth for the telephone, increased revenue from $21.70 to $33.65 in one month.

Whether modern doorless acoustical booths are installed, or existing built-in telephone booths are modernized with new acoustic panels that recently have been made available, the result should be a pleasing increase in revenue. Acoustic panels may now be purchased to line old built-in pay station booths and to make it possible to remove the door. This is a big step forward in making an old booth more inviting in appearance. If a modern booth is used to overcome the disadvantages of a worn out booth, the merchant will be less reluctant to provide a prominent location for the pay station in his store. A secondary, yet important, effect of modernizing booth equipment is the favorable attitude of the public toward such a booth. Booth modernization affords an easy way to improve public relations and at the same time benefit the company financially.



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Incorporation

Lincoln, Neb.—The Glendale Rural Telephone company of Wakefield, Nebr., a nonprofit organization, has filed articles of incorporation. The purpose is to provide telephone service for its members. Incorporators are G. E. Jensen, Otto Nelson and Roy Holm.

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COMMUNICATIONS and ELECTRONIC Developments

Frequency Modulation

General

DURING the past two years much attention has been focused on a new system of radio transmission known as *frequency modulation,* which was brought to its present state of perfection by Major Edwin H. Armstrong. Because of its possible use in cross country relay networks telephone companies have had more than a passing interest in this new development of the communication art.

There are several factors which contribute to the superiority of *wide-band frequency modulation* over the present type of *amplitude modulation,* chief of which are: (1) reception virtually free from static and interference; (2) extremely wide audio fidelity extending from 30 to 15000 cycles with negligible distortion; (3) wide dynamic range extending from the softest whisper to the loudest symphony passage; and (4) freedom from interference between adjacent stations. It will be seen that these advantages eliminate practically all of the old bug-a-boos which limit the present system of radio transmission. The only fly in the ointment is that the present type of radio equipment cannot be used for frequency modulation, and if frequency modulation is to come into widespread use, some 40,000,000 receiving sets and 800 transmitters will be made obsolete.

The advantages possessed by frequency modulation are substantial and have been demonstrated many times to very critical listeners. During thunderstorms, when the static is so bad that reception even on powerful local stations is virtually impossible with the present type of receiver, a frequency modulated receiver will function without the slightest trace of noise. As a matter of fact, the back ground noise is so slight and the receiver operates so quietly, that when the carrier is unmodulated the only way you can tell whether the receiver is on is to look at the dial light! Because of the total absence of back-ground noises, it is possible to transmit by frequency modulation passages so soft as to be overridden by the carrier-hiss of an amplitude modulated station. Since the audio fidelity covers the entire audio spectrum, and since the dynamic range is so wide, the receiver reproduces sound with a fidelity and naturalness unattained by any other means.

Frequency Modulation Defined

THE frequency modulation system of radio broadcasting is not an improved form of the old type of transmission, but is an entirely new system necessitating a different type of transmitter and receiver. In the frequency modulation system, the *carrier amplitude* remains constant at all times, and modulation of the carrier is obtained by shifting the *frequency* above and below the normal carrier frequency.

Since the amplitude of a frequency modulated carrier remains constant, a

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conventional receiver cannot be used to receive the signals. A frequency modulation receiver uses a *limiter* tube to control the amplitude of the signal applied to the detector, which operates on a principle similar to the discriminator on Automatic Frequency Control. The discriminator action of the converter-detector converts the frequency variations of the carrier into audio sound, and the *limiter tube* which removes the amplitude variations of the signal caused by static, prevents the static pulses from operating the detector.

The Mechanics of Modulation

FREQUENCY modulation differs radically in principle from amplitude modulation. Amplitude and frequency modulated carriers are shown in Figures 1 and 2. It will be noted that in the new method the *amplitude* of the carrier wave remains constant, while the *frequency* of the carrier varies in accordance with the audio modulation. The normal unmodulated carrier is fixed in frequency and constant in amplitude. When audio modulation is applied to the carrier, the amplitude remains constant, but the frequency shifts symetrically above and below the normal carrier, the amount of frequency shift corresponding to the depth of the modulation, that is, a soft sound producing only a small change in frequency, a loud sound producing a large change in frequency. In frequency modulation there is nothing about the carrier itself which limits the percentage of modulation. In Major Armstrong's system of wide-band frequency modulation, the ratio between fully modulated and unmodulated carrier was arbitrarily chosen as 10 to 1. That is, for 100% modulation the carrier width is ten times greater than the highest audio frequency to be transmitted. Since frequency modulated transmitters broadcast up to 15000 cycles of audio, the carrier band is 150 K.C. wide. It should be pointed out here that the frequency of the audio signal has no effect on the amount of carrier shift. The amount by which the frequency of the carrier deviates above and below the normal value is controlled by the intensity of the audio sound; the pitch of the audio sound being controlled by the number of times per second the carrier shifts above and below the normal frequency.

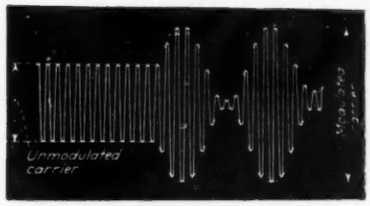


Fig. 1—Conventional Amplitude-Modulated Carrier Wave. (Courtesy Electronics Magazine.)

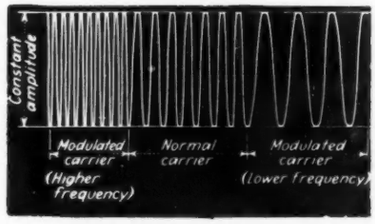
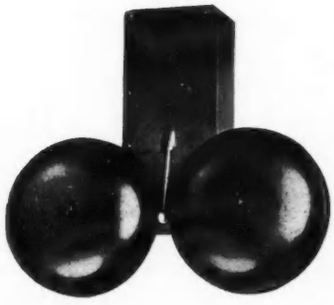


Fig. 2—A Frequency Modulated Carrier Wave. (Courtesy Electronics Magazine.)

An example will illustrate the effect which takes place during frequency modulation. Suppose we have a simple transmitter consisting of a radio frequency oscillator operating at a frequency of say 40 megacycles. If we connect a condenser microphone across the tuned circuit of the oscillator, vibrations of the diaphragm will shift the frequency of the oscillator above and below the normal frequency of 40 K.C. Suppose we impress a 1000 cycle note on the microphone of such intensity as to modulate the oscillator 100%. When the condenser diaphragm moves inward, the oscillator frequency decreases seventy-five kilo-cycles below the normal frequency, when the condenser diaphragm moves outward the oscillator frequency increases 75 K.C. As long as the 1000 note strikes the microphone, the frequency of the oscillator shifts plus and minus 75 K.C. 1000



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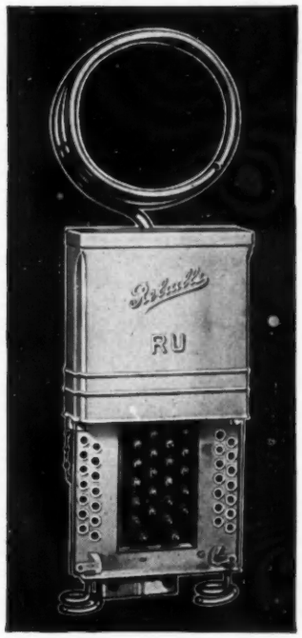

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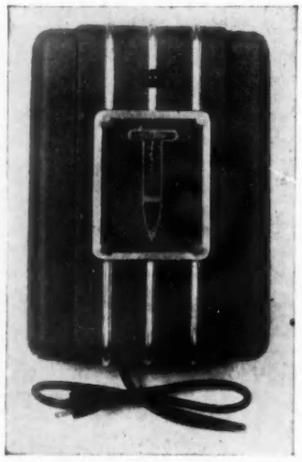

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times per second. Now if we decrease the intensity of the 1000 cycle note so as to produce 50% modulation, the oscillator frequency continues to deviate 1000 times per second, but in this case the frequency only shifts 37.5 K.C. above and below the normal carrier frequency.

Frequency Modulation Receivers

SINCE the amplitude of a frequency modulated carrier remains constant and the frequency varies over a range of 150 K.C. it is obvious that a conventional broadcast receiver cannot be used for frequency modulation reception. Because the wide channel of 150 K.C. is required for frequency modulated transmission, all broadcasting is done on the very short waves ranging from 42 M.C. to 110 M.C. Likewise the wide carrier channel used necessitates the use of a superhetrodyne type of receiver using the staggered type of I.F. coils to permit passing such a wide band without frequency discrimination.

The block diagram of a typical frequency modulation receiver is shown in Figure 3. The first stage is a typical tuned radio frequency amplifier with fairly broad tuning characteristics. Following the R.F. stage is a high frequency converter, which is nothing more than the usual first-detector-mixer such as found in the usual broadcast superhetrodyne.

The first detector (high frequency converter) and high frequency oscillator change the 42.8 megacycle carrier to an intermediate frequency of 6.4 megacycles. Due to the high frequencies involved, a separate oscillator and mixer are used. The first I.F. stage produces a gain of approximately 1000 and then feeds the 6.4 K.C. intermediate frequency into a second converter stage.

The second converter oscillator stage is similar to the usual radio converter where the function of mixer and oscillator are combined in a single tube. The converter oscillator produces a new intermediate frequency of 800 K.C. which is amplified by the second and third I.F. amplifiers.

Up to this point the frequency modulated receiver operates very much like the conventional superhetrodyne, with the exception that two steps were used to change the carrier frequency to the final intermediate frequency.

The output of the third I.F. amplifier feeds into a *limiter tube*. This stage takes the place of the automatic volume control in the conventional receiver. The function of the limiter is to remove any amplitude variations which might exist in the I.F. signal, due to fading, static, or any other cause. The amplitude of the signal leaving the limiter tube is constant under all conditions of signal

(Please turn to page 47)

25 YEARS AGO THIS MONTH

Taken from TELEPHONE ENGINEER files of May, 1917

THE task of helping to recruit the 5000 experts needed in the reserve of the United States Signal Corps was undertaken by the Independent telephone officials throughout the country and a series of meetings held according to the May 1917, issue of TELEPHONE ENGINEER. Mr. F. B. MacKinnon, vice-president of the USITA at that time, was very active in this work. The committee on communication of the council for national defense consisted of five men representing the Western Union, Postal Telegraph, the Bell and Independent telephone companies. The American Telephone and Telegraph company had selected about 500 engineers and "given" them to the army in that same year. The differences between army pay and the regular salaries drawn by those men was paid by the A. T. & T.

The same issue of TELEPHONE ENGINEER, carried the report that the Chesapeake and Potomac Telephone Company was planning to mobilize a number of highly trained special long-distance operators in Washington, D. C. for work of the lines out of Washington in case of emergency.

TELEPHONE ENGINEER in May, 1917 gave the history of the telephone in Hawaii up to that time. Hawaii had its first telephone in 1878—barely two years after the original patent had been granted to Alexander Graham Bell. The first telephone company was organized in Honolulu, Kingdom of Hawaii, on December 30, 1880 and started service with thirty instruments.

Report of a method of controlling aircraft by telephone vibrations which has been demonstrated in London by an Australian inventor, was made in the May 1917 issue of TELEPHONE ENGINEER. Briefly stated, the inventor made use in his device of the well-known principle of resonance.

TELEPHONE ENGINEER issue of May 1917 told that the Central Union Telephone Company had asked for guards at the switching tower at Phoneton, Ohio, because lines to practically all parts of the United States passed through that point and destruction or damage would cripple telephonic communication. Engineers had worked out emergency routes which could be used, but since wires to New York, Chicago and St. Louis centered there, it was considered wise to take every precaution.

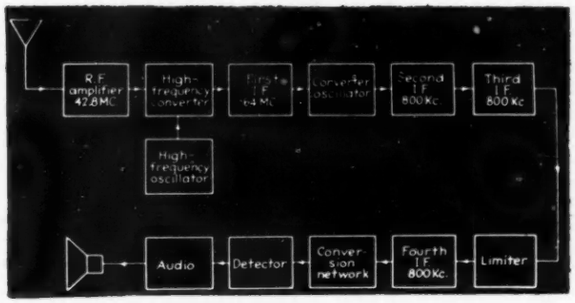

Fig. 3 — Block Diagram of a Frequency Modulation Receiver. (Courtesy Electronics Magazine.)

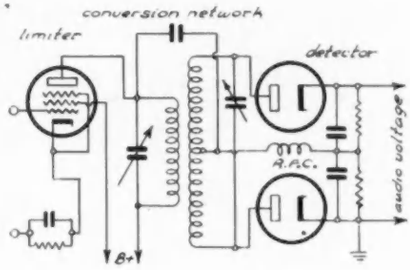

Fig. 4 — The Discriminator Detector Circuit. (Courtesy Electronics Magazine.)

input at the antenna. The limiting action is obtained by adjusting the various tube-element potentials so the tube is operating under conditions similar to a severely overload tube so that the output signal is constant. It is the limiter action which produces static free reception, since it removes any variation in signal intensity and impresses a signal of constant amplitude on the fourth I.F. amplifier.

The fourth I.F. amplifier is required because of the severe attenuation of the signal produced in the limiter stage. This stage is carefully designed to produce uniform amplification over the frequency band of 725 to 875 K.C. A certain amount of cutting of the side bands may be tolerated in the second and third I.F. amplifiers, since the limiter stages operates to remove any variation of signal amplitude. The fourth I. F. amplifier however, must be flat over the range of 150 K.C. but inasmuch as it is not called upon to provide any selectivity this wide frequency range is easily obtained by using broadtuning coils in the I.F. transformer.

The output of the fourth I. F. stage feeds into a conversation network and detector. The conversation network is required to change the frequency variations of the frequency modulated carrier into conventional amplitude variations to operate the detector. The conversion network and detector are very similar to the discriminator used in automatic frequency control. The frequency conversion network is shown in Figure 4. The variable frequency of the frequency modulated wave impressed on the discriminator input results in audio variations at the output of the detector, the magnitude and frequency of the audio variations corresponding to the rate and magnitude of frequency deviation.

The audio system and loudspeaker used with the frequency modulated receiver are similar to the usual audio amplifier and speaker, except that extreme care is used in their design and construction so they will provide excellent audio fidelity over the entire audio range of 30 to 15000 cycles. Many of the better commercial receivers offered for sale contain dual loud speaker units, one for the low frequencies, another for the high frequencies.

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For greater strength and outside plant economy, choose American Creosote Works' southern yellow pine poles. Tests have proven that yellow pine poles are stronger. Pressure treated with creosote, they are thoroughly preserved to assure long life. They stand up in storms, sleet, and high wind.

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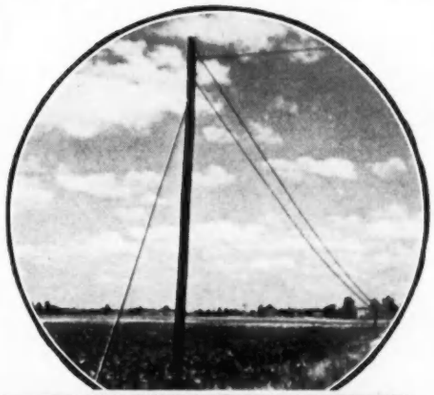

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Telephone Engineer

HANDBOOK TABLES

By B. C. Burden

File—Pole Line
Date—May 15, 1942

Subject: Weight and Shipping Data for Creosoted Pine Poles (ASA Measurements)

General:

The following table and several to follow gives the weight of poles of various lengths and classes, and the number required to fill a railroad car. This type of information is useful when ordering poles or when considering the number that can be carried on a truck or trailer.

Class	Length	Weight	No. for Carload
5	16	254	190
6	16	212	226
7	16	179	268
2	20	555	86
3	20	479	100
4	20	418	110
5	20	353	136
6	20	310	155
7	20	259	185
2	25	808	59
3	25	686	70
4	25	602	80
5	25	508	93
6	25	423	113
7	25	362	132
1	30	1241	39
2	30	1076	44
3	30	921	52
4	30	780	61
5	30	672	71
6	30	573	84
7	30	489	98
1	35	1603	30
2	35	1410	34
3	35	1213	40
4	35	996	48
5	35	865	55
6	35	733	65
7	35	616	78
1	40	1947	25
2	40	1734	28
3	40	1499	32
4	40	1260	38
5	40	1048	46
6	40	884	54
1	45	2369	20
2	45	2087	23
3	45	1772	27
4	45	1528	32
5	45	1250	38
6	45	1062	45
1	50	2820	17
2	50	2435	20
3	50	2068	23
4	50	1777	27
5	50	1476	33
6	50	1246	38

Allied soldiers all over the world are being aided more and more by necessary American equipment. Here is one of China's five million soldiers on duty, at an artillery outpost in Central China. He is using a Kellogg telephone. (Photo by Robert Capra—PIX.)

Stromberg's Last Civilian Radio

The last Stromberg-Carlson civilian radio chassis until victory, will entertain soldiers, sailors, and marines passing through the nation's capital, at the request of Donald Nelson. The radio enclosing the last chassis to come off the production line at Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y. as that company swung into complete production of vital communications equipment for the armed forces, has been offered to the WPB head for use in any military camp of his choosing.

Mr. Nelson chose the President's Reception Room at the Union Terminal, Washington, D. C., transit point for thousands of soldiers, sailors and marines in Washington. Official recipient of the historical final chassis is the Joint Committee for Service of Troops in Transit, made up of representatives of the Defense Recreation Committee of Washington and of the United Service Organizations.

Throws Telephone Wire While Moving 30 M.P.H.

To aid in the speedy establishment of telephone, telegraph and teletype wire communications for troops in the field, the Army Signal Corps has standardized its recently developed wire throwing device which can project telephone and telegraph wire into the air at a distance from roads while a motor convoy moves along at a speed of 30 miles or more an hour.

The wire throwing machine, mounted on a motor truck, can lay telephone wire at a rate of a mile in 2 minutes. It is planned that for troops in the field two trucks will act as a team in laying wire, one picking up where the other truck exhausts its reel. Signal Corps splicers will follow the trucks and unite the ends of the wire to complete the telephone or telgraph circuits. By means of a special ejector the wire can be thrown up into the air to clear obstacles and comes down at a sufficient distance from the road to be safe from the wheels of other vehicles.

Telephone and teletype wire systems for forces in the field, despite the tremendously increased use of fixed and portable radio sets for Army communications, are deemed of great importance particularly for messages to and from division headquarters because of their reliability and relative secrecy from enemy interception.

Bell Station Gain 93,700, April

There was a gain of about 93,700 telephones in service in the principal telephone subsidiaries of the American Telephone and Telegraph Company included in the Bell System during the month of April, 1942.

May Be Last Report

Because wartime restrictions on installations of new telephones will probably make them meaningless as an indicator of business conditions, Bell Telephone Company of Pennsylvania yesterday announced it has abandoned the practice of issuing monthly reports on the number of stations in operation.

The action suggested that all Bell units may eventually discontinue the long-established practice of monthly reports.

Approves Personal Property Telephone Tax

The Rhode Island state senate judiciary committee recently reported out a bill to permit the levy of taxation on the "personal property" of the New England Telephone and Telegraph Co. in the state. The sponsor of the bill cited that the telephone company now pays a 3% tax on gross revenues and that the personal property levy would reduce that tax in half. A similar levy measure on personal property died last year in a Rhode Island house committee.

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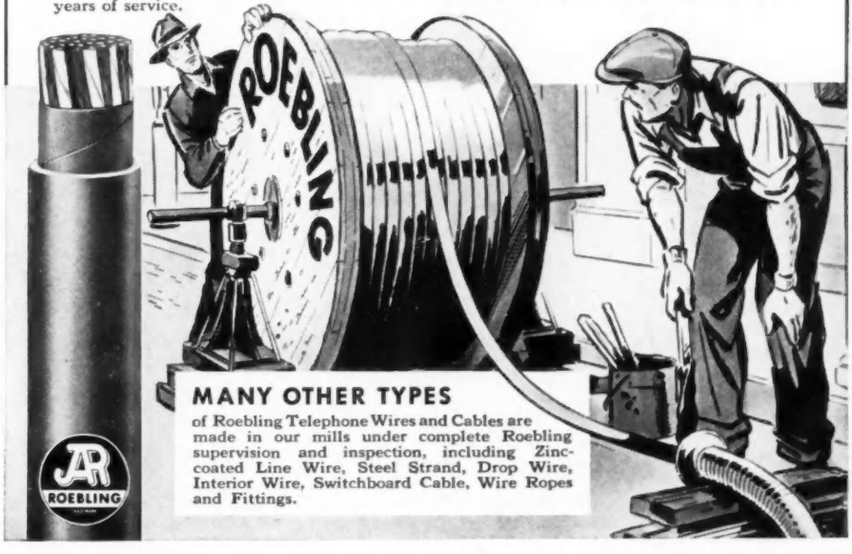

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Communications News

(Continued from page 19)

superannuation of employees. The Plan has the aim of making the separation of retired employees automatic, proper and humane. It contributes, he added, to the morale of the System employees and aids the good public relations of the Bell System which would suffer greatly if veteran employees were harshly turned out of their jobs.

Asks Exemption from WPB Order L-41

THE exemption of telephone companies from the WPB Conservation Order L-41, limiting construction of all types, has been requested of the War Production Board by the United States Independent Telephone Association in a letter which described the duplicated and unnecessary procedure of filing priority rating applications resulting under this Construction order and the recent amended L-50 telephone limitation order.

The letter, which was dispatched to the WPB by Clyde S. Bailey, USITA Washington Vice President, stated that the existence of the L-50 order for limitation of telephone construction makes it "wholly unnecessary" to apply the L-41 construction order to the telephone industry. Mr. Bailey's letter pointed out that telephone companies now have to file two separate sets of applications for each single construction project of $5,000 or more—one would be an appeal application under L-50 and in the case of L-41 application forms PD-200 and PD-200A which are to be sent to the field offices of the Federal Housing Authority in the state where the company is located. Accompanying the two applications to the FHA offices is another PD-1 application which goes to the Communications Branch. Telephone construction projects of $5,000 or more have been construed as falling under the applicability of paragraph (a) (5) of the L-41 order, entitled "Other Restricted Construction," so telephone companies have been complying with both the L-41 and L-50 orders.

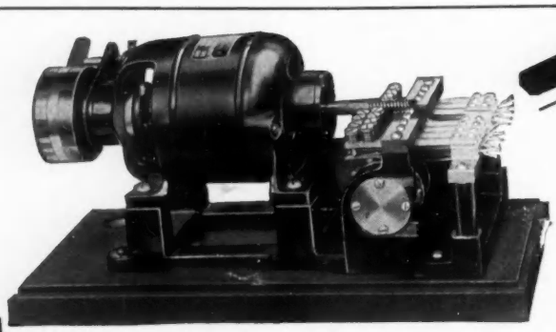
"This awkward, duplicated and unnecessary procedure, covering the same proposed construction or the same equipment," Mr. Bailey stated, "we are sure was not purposely designed. We are equally sure the Board will desire to correct it." Citing that the telephone industry would like early action to correct the procedure, Mr. Bailey wrote the WPB that the present duplicated requirements under L-41 do not contribute to conservation of strategic materials but "operate only to create confusion and cause delay."

MEANWHILE, the Communications Branch of the WPB was in the final stages of formulating the report forms to be filed by telephone companies in connection with the April 23 telephone limitation order (amended L-50), and the maintenance and repair and operating construction orders. The telephone companies are to file monthly reports by the 10th of each month on the denials of service to civilian subscribers and the use of the minor cable extensions of less than 100 pounds of copper. Quarterly reports are to be submitted on the inventories under the maintenance-repair order and upon the operating construction uses of strategic materials. The Communications Branch is completing the forms so as to be ready for distribution by the latter part of May and the telephone companies then will file their reports for that month and for the past quarter by June 10.

At the same time, the Communications Branch's Telephone Section was planning to issue in the near future a question-and-answer analysis of the amended L-50 order so as to give the telephone industry some interpretations about difficult phases of those regulations.

The text of Mr. Bailey's letter to the WPB was as follows:

On behalf of the United States Independent Telephone Association I am writing to invite your consideration to the need for and desirability of making



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an amendment to Conservation Order No. L-41 so as to exempt telephone companies from its provisions.

Our Association is the national organization representing the Independent telephone industry of the United States. The industry consists of approximately 6400 companies, independently owned, which furnish telephone service to about 12,000 cities and towns. These companies operate more than 4,600,000 telephones, or one out of every five in the country.

As L-41 has been construed its provisions are applicable to all telephone companies. This arises apparently out of the meaning given to the word "utilities" appearing in paragraph (a) (5), "Other Restricted Construction."

The order is silent, however, so far as any definition of the word "utilities" is concerned. It is admitted, of course, that a telephone company is a public utility and that it has been uniformly so regarded by courts and commissions. But confusion on the part of some of our member companies has arisen by virtue of the fact that in another order, P-46, "utilities" was specifically defined to include gas and electric companies and certain other specified utility enterprises,—telephone companies not among them.

It has accordingly been assumed in some quarters that when the Board used the term "utilities" in L-41 it intended to embrace only the specific types of utility companies covered by the P-46 order.

L-41 became effective on April 9, 1942. At that time there was already in effect an order exclusively covering the telephone industry. This was General Conservation Order No. L-50, the scope and purposes of which were enlarged by more restrictive language contained in an Amendment thereto effective on April 23rd. The provisions of L-50 effectively stop telephone companies from expanding their plant or facilities except pursuant to special permission obtained through the medium of an appeal as provided in paragraph (g).

The existence of L-50, covering the telephone industry exclusively and alone, makes it wholly unnecessary that L-41 be applied to this particular class of utility. With two outstanding orders applicable to telephone companies two separate sets of applications must now be filed, vis., an appeal application under L-50, and a PD-200 and PD-200A under L-41. Incongruously these two appeals or applications, by the terms of the respective orders, are not required to be sent to the same agency for processing and disposition. The appeal under L-50 is to be sent to the War Production Board, while PD-200 and PD-200A under L-41 are to be sent to the "field office of F.H.A. having jurisdiction over the location of the site." (See Schedule A attached to L-41.)

The situation confronting us also arises out of an interpretation given the word "Construction" in paragraph (a) (2) of L-41 so as to include "project" if the cost of the "project" is $5,000 or more. Thus at the present time if a telephone company desires a switchboard or other telephone equipment which costs $5,000 or more it must not only file a PD-1 which is processed and disposed of by the Communications Branch of the Division of Industry Operations, but it must also file a PD-200 under the terms of L-41 with the F.H.A.

This awkward, duplicated and unnecessary procedure, covering the same proposed construction or the same equipment, we are sure was not purposely designed. We are equally sure the Board will desire to correct it.

We are taking these means of drawing your attention to the matter in the hope and belief that you will wish to take early action through the medium of an amendment or by other appropriate measures to exempt telephone companies from the terms of L-41.

We are deeply conscious of the need for conservation of critical materials, and it is our desire to cooperate to the fullest extent in this endeavor. The present duplicated procedure under L-41, however, does not contribute to conservation; it operates only to create confusion and cause delay.

"Definitions of Electrical Terms" Issued by AIEE

A new American Standard known as Definitions of Electrical Terms, C42, sponsored by the American Institute of Electrical Engineers, is now ready for general distribution. The issue of this volume of electrical definitions as an American Standard should mark an epoch in the literature of the electrical art in America, as it is the first time the definitions of the important terms common to all branches of the art as well as those specifically related to each of the various branches have been assembled and printed under one cover.

The "Definitions" book is a sturdy volume of some 300 pages, 8x11 inches. Price is $1.00 net each in U.S.A. to all on single copies or in quantity. $1.25 outside U.S.A. Address AIEE Headquarters, 33 West 39th St., New York, N. Y.

Signal Corps Lauded For Job on Bataan

The "magnificent job" of the Army Signal Corps in maintaining communications from the Bataan Peninsula during the heroic four months' blocking by the American-Filipino force of the overwhelming Japanese army has been described in press dispatches from Australia by American newspapermen who left the Philippines to carry on their war news coverage from the "land down under." The accomplishments of the Signal Corps were demonstrated by the fact of the steady flow of news dispatches from the American press association correspondents with the American forces at Bataan and Corregidor.

Closes Exchange

The Endeavor Telephone Company, operating a telephone exchange at Endeavor, Hickory Township, Forest County, Penn., and furnishing telephone service to 80 subscribers in the township, has applied to the Public Utility Commission for authority to discontinue operations.

According to the company, the business, it is said, has operated at a loss for the past four years.

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Kellogg No. 103 1-M. F. Condensers 40c ea. W. E. No. 21 2 M. F. @	.35
Kellogg No. 51 C. B. Ind. Coils @	.35
Leich or Monarch L. B. Transmitters complete with back & M. P. @	.90
Chicago Tel. & Supply ½ or 1 M. F. Cond. @	.30
Western Elec. No. 323 or Kellogg No. 22 Trans. with back & M. P. @	1.10
L. M. Ericsson Receivers with slip type Units and Repolished Shell and New Cord @	.90
Automatic Elec. 2 M. F. Condensers @	.35
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Kellogg Long Lever No. 63 Switch hooks complete @	.50
Chicago Tel. Supply Co. 5-bar Bdg. Hand Gen. with crank & Mtg. Screws	3.25
Western Elec. No. 156 A Listening & Double ringing keys with Battery cut off @	2.50

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I. T. & T. to Expand

The International Telephone and Telegraph Corporation has been granted by the U. S. Export-Import Bank a credit up to $25,000,000 to enable it to acquire as large a quantity of its outstanding debentures and to expand and maintain its communications manufacturing facilities and telephone operating properties in the Western Hemisphere. In announcing the credit authorization, Secretary of Commerce and RFC Chairman Jesse Jones stated the advance of funds was to aid the I. T. & T. in continuing the development of its South American properties along lines of the recent survey of Hemisphere communications by a special governmental committee.

Super-Sensitive Microphones Combat Plant Sabotage

Microphones so sensitive that a snipped wire would sound like a thunder-clap at the receiver will join the fight against sabotage, the Stromberg-Carlson Telephone Manufacturing Co. announced March 12. The microphones would be installed at concealed positions around the factory fences, and one is sufficient to pick up muffled sounds along 3,000 feet of fence. Any sounds outside the fence are thus relayed, amplified considerably, to the guardhouse. The system can also be geared to relays which cause noises to flash a red light. An A-1-a priority rating for materials to produce the systems has been granted Stromberg-Carlson by the War Production Board.

WANTED—Central office maintenance man, capable of maintaining 800 line switch type Automatic exchange and handling associated work. Located in Alabama. Prefer married man over draft age. Give all details of experience, citizenship and salary expected, in first letter. Small photograph desired. Address TELEPHONE ENGINEER, Box 8276.

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Vacancies are available for men capable of installing central office telephone or similar equipment who are not already engaged in work directly essential to the war effort. Must be free for assignment anywhere. In reply state age, qualifications, past employers, experience, citizenship status, and number of dependents. Address Box 8275, c/o TELEPHONE ENGINEER.

New Service Announced

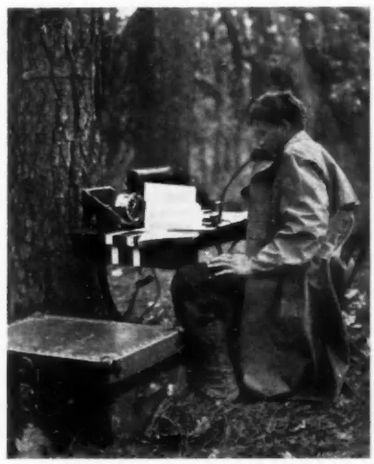
It is a well known fact that the conductor used in telephone and switchboard cords has been developed to a point where it will outlast the outer cover or braiding. When the outer braid is worn on switchboard cords, the cords are cut back several times until the reenforced plug ends are used up.

Inasmuch as the conductors used in telephone instrument cords are the same as are used in switchboard cords, it is only reasonable to expect that the conductors in telephone cords should outlast the outer braided cover.

Sometime ago The Commercial Cord & Supply Company, Clifton Springs, N. Y. gave this feature of rebraiding telephone cords a tryout and since, have rebraided large quantities of cords for large and small telephone operating companies, and have reasons to be proud of the response received from the companies who are using this service.

The cost of rebraiding cords is but a fraction of the cost of new cords.

This is not only an economy but at a time like this should be the means of conserving considerable materials which on account of the war have become critical.



How would you like to have your office right in the woods? The Kellogg Switchboard & Supply Company of Chicago has obtained this photograph of their telephone equipment used by the U. S. Army Signal Corps. The young man has made a creditable office out of this woodland retreat. His desk is a table. His files are no doubt in the trunk. A clock, a stapler and evidently his field glasses comprise the rest of his office equipment. Army life has its recompense. This is a far more delightful office than the one he was couped up in when working in some factory before the war.

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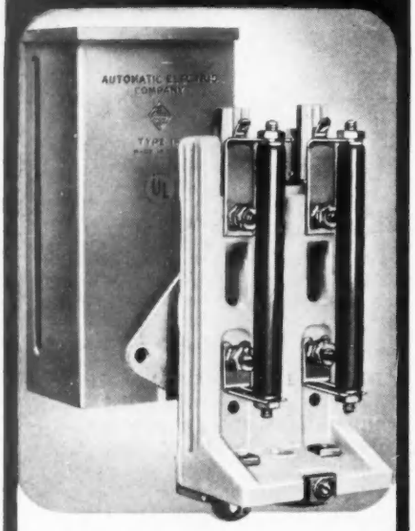

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Index to Advertisements

A

Acme Visible Records, Inc. —
Acorn Insulated Wire Co. 43
American Creosoting Co. 47
American Crossarm, Inc. —
American Crossarm & Conduit Co. 44
American Elec. Heater Co. —
American Steel & Wire Co. 38
American Tel. & Tel. Co. 12-13
Anaconda Wire and Cable Co. —
Armstrong Cork Co. —
Associated Tel. and Tel. Co. —
Automatic Electric Co. 14-28-29-30-34-38-43-44-48-54-56
Automatic Tel. & Elec. Co., Ltd. —

B

Banks Mfg. Company —
Barnard Co., B. S. —
Bartlett Mfg. Co. —
Berry, L. M. 52
Brach, L. S. Mfg. Co. 44
Buckeye Telephone Supply Co. 53

C

Cable Spinning Equipment Co. —
Calculagraph Co. 34
Carney & Company 52
Carpenter Mfg. Co. —
Chance Co., A. B. —
Channel Splicing Machine —
Chisholm-Ryder Co., Inc. —
Churchill Cabinet Co. 35
Coffing Hoist Co. 20
Columbia Steel Co. 38
Communication Equipment & Engineering Co. —
Cook Electric Co. 27
Cope, T. J. Inc. 42
Copperweld Steel Co. 8
Cramer Posture Chair Co. —

D

Davey Tree Expert Co. —
Davison Chemical Corp. 10
Dicke Tool Co., Inc. —
Dillon, W. C. & Company 50

E

Electric Storage Battery Co., The 11
Estwing Mfg. Co. —
Eveready Dry Cells 14
Everstick Anchor Co. 7

F

Fansteel Metallurgical Corp'n. —
Forged Steel Products Co. 15
Fyr-Fyter Co. —

G

Gardiner Metal Co. —
General Cable Co. 41
General Electric Co. —
Graybar Electric Co. 31
Gray Manufacturing Co. 36

H

Hammond Drierite Co., W. A. —
Herdrich & Boggs —
Holtzer Cabot Electric Co. 50
Hubbard & Co. 43

I

Indiana Steel & Wire Co. 51-47

J

Jackson Lumber Co. —

K

Kearney Corp., Jas. R. —
Kellogg Switchboard & Supply Co. 4-5-6-7
Kester Solder Co. 10
King, W. T. —

L

Leeds and Northrup Co. —
Leich Sales Corp. 2-3
Lenz Electric Mfg. Co. 14
Line Material Co. —
Loomis Advertising Co. 52
Lorain Products Corp. 35-36

M

N. W. Matthews Corp. —
MacGillis & Gibbs —
Michigan Pole and Tie Co. —
Jay G. Mitchell 52

N

National Carbon Co. 16
National Telephone Supply Co. 14-55
North Electric Mfg. Co. —

O

Oliver Iron & Steel Corp. 40
Oneida Cedar & Lumber Co. —
Owens-Illinois Glass Co. —

P

Page and Hill Co. 37
Paine Company, The —
Paragon Electric Co. 37
Paramount Products Co. 10
Pearl, Wm. H. —
Peatrophone Corp. —
Phillips Electric Works, Ltd. 34
H. K. Porter, Inc. —
Premax Products 42
Putnam & Company 38

R

Raytheon Mfg. Co. 39
Rebuilt Electric Equipment 52
Reliable Electric Co. 45
John A. Roebling's Sons Co. 49
Runzel Cord and Wire Co. —

S

Seymour Smith & Son —
Sellers, Maurice —
Shallcross Mfg. Co. —
Sherron Metallic Co. —
Siemens Bros. & Co., Ltd. —
Speedometer Elec. Co. —
Stromberg-Carlson Tel. Mfg. Co. 9-33-35-37-47
Suttle Equipment Co. 45

T

Taylor-Colquitt Co. 62
Telkor, Inc. 46
Telephone Print Co. 53
Telephone Repair Co. 53
Telephone Engineer 55
Texas Creosoting Co. 48

U

Unique Mfg. Co. 53
Union Carbide & Carbon Co. 14
U. S. Steel Corp. 38
U. S. Independent Tel. Assn. —

V

Valentine & Clark Corp. 52

W

Wagner Malleable Products Co. —
Western Electric Co. 14-15
Williams, Geo. E. —
Wopat, J. W. 52
Wray, J. G. & Co. 52

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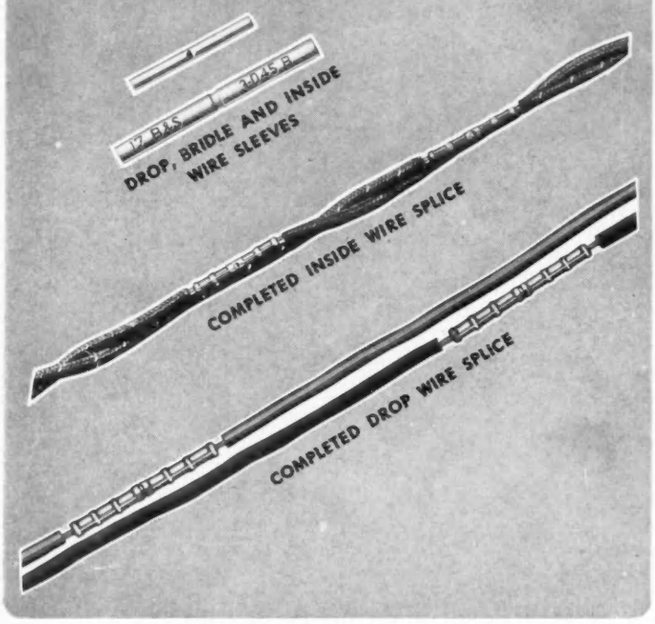

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